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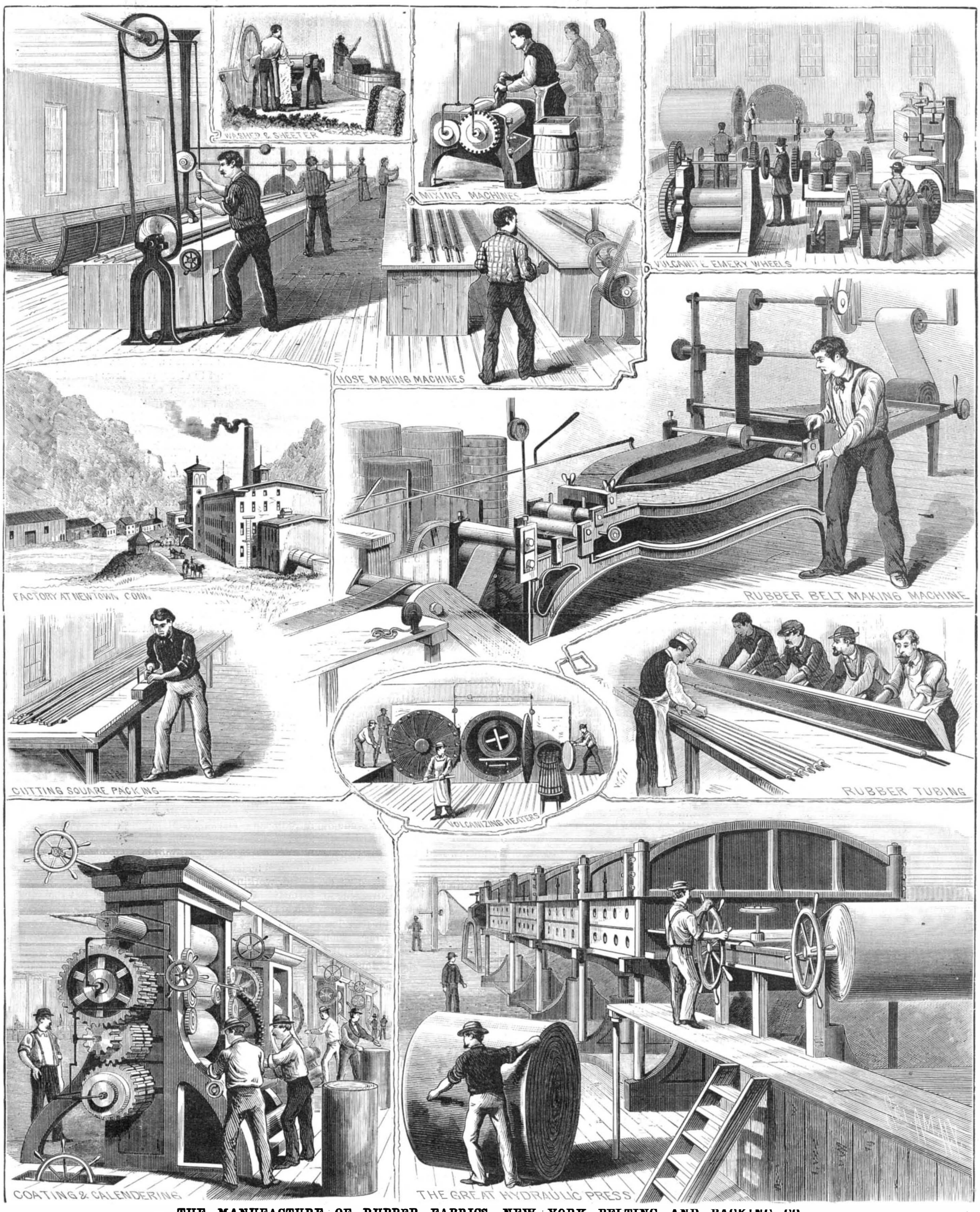

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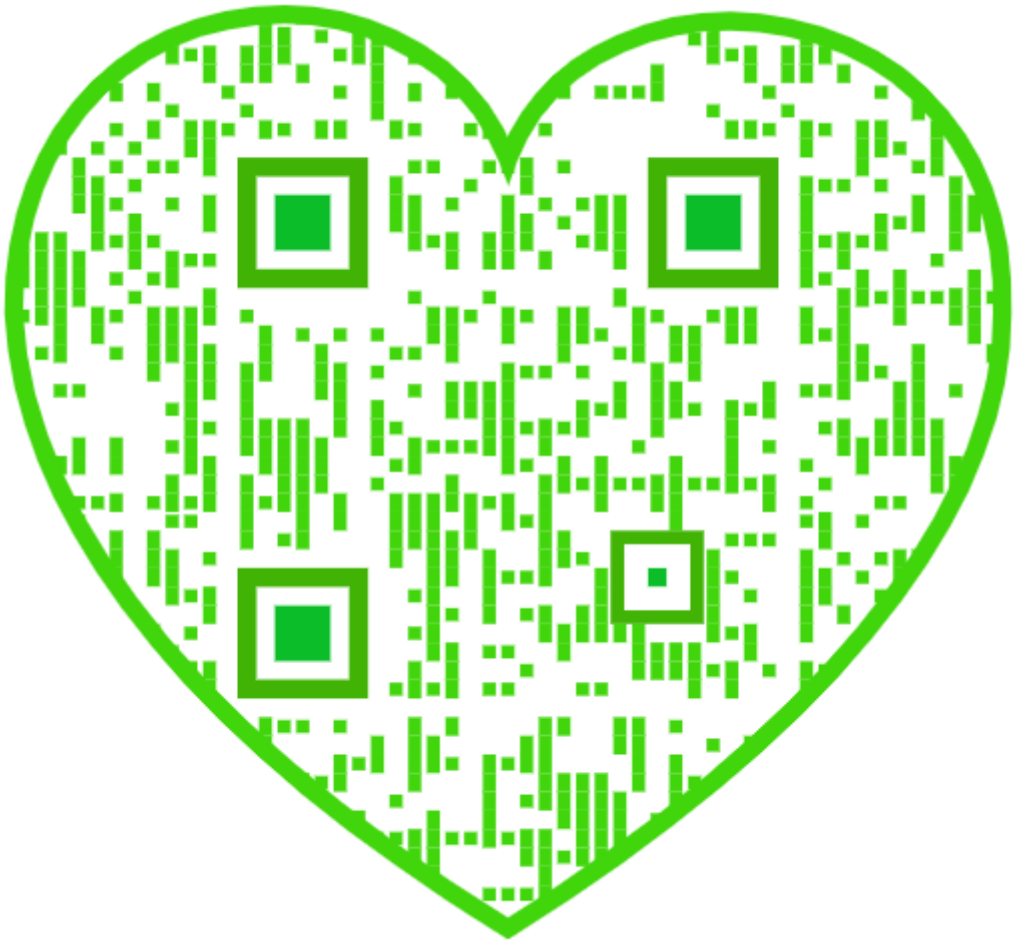

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Contents.

(Illustrated articles are marked with an asterisk.)

American industries*.....15, 20
Anthracite, voyage of the..... 21
Ants, slave-making..... 17
Artic expedition, Howgate..... 26
Brake, electric, for R. R. cars*... 18
Canal boat, large..... 22
Cincinnati industrial exhibition.. 21
Clocks, pneumatic*..... 19
Coins, to clean (2)..... 27
Cold, severe, effect of on insects. 23
Corn sled, novel*..... 22
Creamery, centrifugal..... 23
Decisions relating to patents..... 21
Discoveries at Pompeii..... 26
Earthquake warnings..... 17
Elevator, Brooklyn, new..... 24
Elevator, improved*..... 24
Engineering inventions 19
Engine, exhaust of (6)..... 27
Exhibition, Melbourne, the..... 21
Expedition, Arctic, Howgate..... 26
Exposition and fair, Pittsburg..... 21
Exposition, industrial, Cincinnati 21
Fabrics, vulcanized rubber*...15, 20
Fish hatching, Government..... 22
Fishway, improved*..... 22
Fruit, preservation of..... 18
Glass, to remove scratches (11)... 27
Gorilla, another, in Philadelphia 26
Grain product, California..... 22
Hops, preservation of 24
Horse power of engines (10)..... 27
Horseshoes, improvement in*.... 18
Howgate Arctic expedition..... 26
Ice trade in Maine..... 26
Industries, American *..... 15, 20
Insects, effect of severe cold on. 23
Inventions, engineering..... 19
Inventions, miscellaneous..... 18
Inventions, new..... 25
Iron and steel making..... 26
Lesson, a, to young men..... 26
Lifeboats, steam, improved 22
Maine, ice trade in..... 26
Malt dust, explosions of..... 24
Matter, indestructibility of 17
Matter, the structure of..... 25
Medical Society, American..... 26
Melbourne exhibition, the..... 21
Men, young, a lesson to..... 26
Millers, the, and the patent laws. 16
Mucilage (11)..... 27
Natural history notes..... 23
Nemertes, or striped polia*..... 23
Oysters, American, transplant'g. 18
Pants, patent..... 17
Patent pants..... 17
Patents, decisions relating to.... 21
Pavements, electrical..... 17
Phenomenon, curious, a..... 24
Photographs, winking..... 21
Photo plates, sensitiveness of.. 22
Pittsburg exposition and fair.... 21
Pompeii, discoveries at..... 26
River waters, are they safe?..... 17
Rivers, purification of..... 18
Rubber fabrics, vulcanized*.....15, 20
Scratch brush, liquid for (1) 27
Seal, a, caught in New York 22
Sea otter, or kalan*..... 23
Silk, inflammable, more 26
Silvering by cold rubbing..... 18
Silver, recover from solutions (3) 27
Skin grafting from the dead..... 17
Sled, corn, novel*..... 22
Soldiers, cost of keeping..... 21
Starch for laundrying (8)..... 27
Structure, the, of matter..... 25
Sun, temperature of the..... 21
Sutter, John A., Gen'l..... 21
Temperature of the Sun..... 21
Tetanus, successful treatment... 25
There's room at the top..... 16
Time, fastest, on record..... 26
Towing feat, great..... 24
Vulcanized rubber fabrics*.....15, 20
Watch trade of the U. S..... 17
Wind pressure..... 24
Young men, a lesson to..... 26

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 236,
For the Week ending July 10, 1880.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Coal Getting Machine. 1 figure. The Rigg-Meiklejon coal getting machine..... 3754
Railway up Vesuvius. 1 large illustration. View of station, railway, and mountain..... 3754
An Interesting Experiment. Holland's Hydrocarbon retort..... 3755
The Adhesion of Belts. By J. H. COOPER 3755
Aubin's Direct Bolting Portable Mills. 4 figures. Vertical section (side).—Vertical section (end).—Horizontal section.—Section of millstones, showing how they are mounted..... 3756
New Gas Soldering Iron. 1 figure. A. L. Vangel's improvement. 3757
Direct Bolting Portable Mills. Hubin's system 3757
David's Improved Draughting Templet. 2 figures..... 3757
Popular Fallacies in Engineering, and How to Meet Them. By HENRY MORTON, President Stevens Institute of Technology. Perpetual motion frauds.—The Readhefer machine.—The Paine electric engine swindle.—The Keely motor.—Fallacious engines.—Never make two experiments at once.—Anti-incrustators.—Mechanical fallacies.—Chemical fallacies.—Force and energy..... 3757

II. ELECTRICITY, LIGHT, ETC.—Experiment of MM. Lontin and De Fonville. By M. JAMIN..... 3759
New Enlarging Lens for Magic Lantern. 4 figures 3759
Wind Pressures. 3 figures..... 3760
Durability of Gutta-percha used for Telegraphic Purposes..... 3761
New Experiments in Magnetic Attraction. By M. ADER 3762

III. CHEMISTRY AND TECHNOLOGY.—Nitrogen in Iron and Steel 3761
Development of Acetic Acid in Beer..... 3761
The Preservation of Timber. By J. W. PUTNAM. The teredo navalis and the treatment of wood to prevent its assaults. Dead oil and the method of applying it..... 3762

IV. HYGIENE AND MEDICINE.—Stimulating Drinks. Khooshafs —Sherbets.—Tiste.—Ginger tea.—Margol wine.—Drink of the Fort Rupert Indians.—Labrador tea.—Parched meal and water.—Orange wine.—Rice wine.—Spruce beer.—Licorice tea.—Walnut wine.—Brick tea.—Sarsaparilla.—New Zealand native wine.—Quaes.—Guarana tea.—Yerba mate.—Cider and perry.—Honey wine.—Soua.—Native wines, etc 3764
An Advance in Therapeutics..... 3764
The Stranger within thy Gates 3764

V. GEOGRAPHY, ETC.—Washington Territory. Climate.—Arable and timber lands.—Productions.—Mineral resources.—Manufacturing interests.—Exports —Navigation and railways.—Population.—Price of land.—General remarks..... 3761
The South Pacific Islands. Gilbert group.—Marshall Islands.... 3762
A Hawaiian Almanac..... 3762

VI. NATURAL HISTORY.—The Electric Eel (*Gymnotus electricus*). 1 figure. Electric eel..... 3753
Intelligence of Seals. 1 figure. Skiff drawn by a seal..... 3754
The Food of Birds.—Prof. Forbes' study of thrushes..... 3754
Alders for the Lawn..... 3764
Forest Trees of North America. Prof. CHAS. SARGENT'S catalogue. Continued from SUPPLEMENT, No. 235..... 3765

VII. MISCELLANEOUS.—International Fisheries Exhibition at Berlin. Description of exhibits.—Awards to Americans. 1 illustration. Neptune's Grotto, Berlin Fish Exhibition..... 3751
American Bacon and Pork. Statistics of American Swine and pork packing.—How the hogs are dressed.—Preparation of bacon. Making hams.—Sausages.—The yield of lard..... 3752
The Cultivation of Barley..... 3763

THE MILLERS AND THE PATENT LAWS.

We doubt whether there has ever before been so large and complete an exhibition of the mechanical appliances of any trade, in practical operation, as that which was presented by the Millers' International Exhibition just closed at Cincinnati. The milling business has made great progress within a few years past—so great that a revolution may almost be said to have been effected therein—and old methods of making flour are everywhere being superseded by a radically different system, whereby the quality of the product is greatly improved. Nowhere else has the contrast between the old and the new method and their products been shown in such marked contrast, with such an extensive display of every kind of machinery, as in the Cincinnati Exhibition, and yet there is hardly a machine or an article for collateral use in the trade, which has materially contributed to its recent progress, that is not patented. It is our patent law, the protection it gives to inventors, the encouragement it offers to those who devote their time and means to improving old processes, that has chiefly made this splendid exhibition what it is.

And yet, strange as it may seem, with this practical proof before them of what the patent law has done for their business, the millers, in convention assembled, proceeded to make one of the most foolish and unreasonable attacks upon our patent system we ever remember to have seen formulated. The Millers' National Association of the United States have a standing committee on patents, and at their recent meeting in Cincinnati this committee made a report, which was adopted by the convention, avowedly to aid in "reforming" our patent laws and practice, and to "measurably free users of patented devices or processes from expensive litigation," etc. The "reforms" proposed include nearly every variety of objection to our patent laws which habitual infringers are in the habit of urging, and are as follows:

I. "More liberal appropriations by Congress to the Patent Department, enabling closer scrutiny of applications for patents, and consequent avoidance of the too frequent granting of patents on claims in which the essential features of novelty and usefulness are wanting." Is not the committee aware that the total expense of the Patent Office is paid by the inventors themselves, and that the examinations always involve a search through all like claims ever filed in the department? And if a patent be issued for anything that is not "useful," are not the millers aware that it is invalid and good for nothing, and is it any great hardship to ask the millers to let a thing alone if it is not useful?

II. "The abolition of the practice of reissue under new date or title, and sometimes for new things scarcely hinted at in original." If a miller obtains a defective title to real estate, through carelessness or error of his own, the courts will aid him to correct such title when it can be done without prejudice to the rights of others. Why should not a patentee, proceeding in good faith, have the like privilege? Further than this, a reissue is not valid if it covers "new things" involving different principles from what were set forth in the original patent.

III. "The establishment and maintenance of a special patent court at Washington to determine the validity of patents, before which court all parties directly or remotely interested in any case pending shall have ample time and opportunity to be legally and publicly heard." This is really a strange point to make in behalf of those who are now so vigorously protesting against the expense of patent litigation. It is proposed to have a new court, which cannot supersede, but must be auxiliary to the law machinery we now have, and to impose upon litigants in all parts of the country the necessity of a preliminary trial of their case at Washington, instead of having the trials take place as at present in the several districts where they reside.

IV. "The annual assessment of such a tax upon existing patents as can only be paid by owners of useful patents, and which, in default of payment of renewal tax, will free the records of worthless patents." It might just as rightfully be proposed that all flour mills making a low grade of flour should be taxed out of existence. The impositions of a tax on patents on such grounds would be nothing more nor less than direct robbery.

V. "A reasonable limit during which an inventor or patentee must successfully introduce his improvement to practical use and notice, in order to claim against any who may thereafter use the same." The present law makes seventeen years such reasonable limit, during which the inventor must not only introduce his improvement, but make therefrom all the profits which are to pay him for the time and means he has devoted to its development. This is the consideration which spurs him to effort, and the public, at the end of the seventeen years, becomes possessed of the free right to use his invention or discovery, whether or not they pay for its use before that time.

VI. "Some more reasonable measure of damages, with reference to actual benefits, in cases of established infringement." The courts always insist upon an accounting to show what gains or profits an infringer has made by his use, without permission, of the property of another. In this accounting the infringer has a right to show what other means were open to him whereby he might have avoided the use of the patent, and in this way it has often been shown that the patent he infringed upon was of no value at all to him. In many such accountings the damages for infringement have been placed at only six cents, and in all cases they are assessed by the court only after a full hearing of what both sides have to say. If a "reasonable measure" of damages cannot be arrived at on such investigation, we fail to see how in this fallible world such object is even to be attained—that it should *never* be reached would probably be nearer what the committee would recommend.

VII. "Greater restrictions in the granting of injunctions, before the validity of a patent has been tried and established, and also preventing the fixing of excessive bonds in cases where temporary injunctions are granted." The general practice now is not to grant injunctions until the validity of a patent has been established, unless it is evident that the alleged infringer is deliberately endeavoring to avoid the consequences of his infringement and escape the jurisdiction of the court. The amount of the bonds which must be given are in each case regulated by the probable measure of damages, and are so fixed by the courts only after an examination in which the infringer has an equal right with the patentee to be heard.

VIII. "An amendment to the effect that, when new suits are begun under the same patent, in which a decision has already been made in a lower court, and appealed to a higher court, the defendant may demand a stay of proceedings pending decision in the higher court, and that he may become a party in the pending suit, avoiding the unnecessary expense of special defense, requiring the taking of testimony, and construction and explanation of models already on record." This is according to the general practice of our courts at the present time, except that the defendant has no *right* to this stay, and to be made a co-defendant in another suit, unless in accordance with the judgment of the court. When a stay of proceedings is granted in such case it would be a grave injustice to the patentee to allow his rights to go by default during the pendency of a long litigation, but by the giving of proper bonds by the defendant the court will generally grant the stay.

Finally, to "give force to these recommendations," as the committee say, it is urged that the association should make itself "financially strong," to prevent the granting of what they are pleased to style "fraudulent patents or reissues," for which they would have paid lawyers constantly "on the alert" in Washington, all the millers in the country contributing to funds for such a purpose. Is not this a direct proposal to attempt to circumvent laws passed in pursuance of an important provision of the Constitution? And are not the beneficent effects of those laws written in every leading feature of the great exhibition now just closing? If the millers, or representatives of any other industry, combine to obstruct the equitable administration of our patent laws, is it not just possible that inventors and patentees may, by like combinations, even more energetically defend their legal rights?

It is matter of astonishment to us that the millers of this country, supposing they are truly represented by the committee, have seen fit to take this view of our patent law. We should rather have thought that a system which has done so much for them would have met with nothing but kindly words, and that inventors would have received that encouragement from them which alone will induce them to put forth vigorous efforts to perfect that system of milling improvements which has already made such progress, but which is yet far from having attained perfection.

"THERE'S ROOM AT THE TOP."

The young man ambitious to succeed in any line of business should always bear this in mind. There are those in plenty of mediocre ability, superficial acquirements, and inadequate preparation, but the thoroughly trained and competent are scarce. The standard of modern professional requirements has been greatly elevated by the advances which the world has made within a few years past, and still higher demands are constantly being made. The demand for men who have a complete knowledge of every department of their business has always been felt. The extent of that knowledge widens every year, as improved methods and facilities are introduced. The ship captain, for instance, who a few years ago needed only to be acquainted with centuries-old theories of navigation, with what more recent geographical explorations had added thereto, now finds himself, in this age of steam, working under totally different conditions. What he formerly knew is equally necessary now, but the successful management of a ship propelled by steam calls for an entirely new set of ideas and experiences, and the captain who would at present be a thorough master in his profession should not only know how to run a steam engine, but be a practical hydraulic engineer, with a good knowledge also of pneumatics and electricity, in order to avail himself of all the advantages which recent discoveries and inventions have placed at the disposal of navigators, whereby more efficient work may be done and a higher degree of safety attained. There are captains in plenty who are sailing masters only, but in proportion as they are also competent in these other departments, whereby they become in fact independent of their subordinates, do they attain the higher positions and greater responsibilities of their profession.

And what is true in this instance may be said of nearly every branch of business, as we find a like necessity for greater amplitude and thoroughness of preparation in all lines of professional activity. The discoveries in chemistry within a few years past have been of far reaching importance, and many of them have been such that a first-class doctor cannot remain ignorant of the advances made and retain his position in the front rank of his profession. With lawyers, also, a greater familiarity is expected with all departments of modern science, so that many members of the bar

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at the present day may be really classed as experts in the technicalities of important industries. And with these demands for a higher standard of preparation the facilities for its attainment have been so multiplied that they are easily within the reach of all who have the disposition and the energy to avail themselves of the opportunities offered.

One peculiarity in the conduct of our leading industries, however, has operated rather to hinder the attainment of this higher standard of excellence among workmen in many cases. The "division of labor" now carried out in such detail in most branches of business has given us great numbers of workmen who know only a small portion of a trade, and, unless the mechanic be ambitious to rise in his avocation, he becomes little better than a machine. Blacksmiths, machinists, carpenters, masons, painters, shoemakers, etc., are now divided into separate classes of workmen who are masters only of some specialty in their trade, rather than the whole trade, and but seldom endeavor to reach a practical knowledge of all the other departments of their own business. To illustrate from what is certainly one of the least complicated of our trades, in a modern shoe factory we find, besides the cutters, fitters, and makers of the uppers, there are different sets of men employed for lasting, heeling, trimming, burnishing, finishing etc., the finished boot or shoe in most cases being the work of six to ten hands, each of whom knows only how to do his particular part. This division of labor undoubtedly gives the best results in the aggregate for the community, but the ease with which workmen attain proficiency in one small item of a whole trade undoubtedly tends to check that ambition to excel which has thus far been the most marked characteristic of American mechanics.

"I have taken all knowledge to be my province," wrote Lord Bacon, in 1592, when he was only thirty-one years of age. The expression often occurs to us when we consider what is now expected from first-class mechanics as well as from professional men. Bacon excelled all other men of his day in a "knowledge of the mutual relations of all departments of knowledge," and his philosophy, more than that of any one else of his time, taught "the art of inventing arts." Taking his meaning in this sense, there are many to-day who might fitly say what Bacon said of himself. But this is preeminently a practical age, and, while it shows the best possible development of the Baconian philosophy, it requires, of all who would stand at the head in any department of the world's activity, an amount of practical knowledge of which he had only a general conception. The multitudes which now crowd upon each other in the competitions of life are of those who do not meet the call for that better culture and more complete preparation of which society can never have enough, and which the diversified industries and great enterprises of modern times will always find ample employment for. "There is always room at the top," said Daniel Webster, in reply to the inquiry of a young lawyer as to the chances of success in his profession, and only those who pursue their avocations, of whatever nature, with this in mind, are certain to succeed.

PATENT PANTS.

As showing the importance of some of the minor patents the recent litigation of Strauss *vs.* King, reported in another column, presents a curious example. This is a patent for placing a metallic rivet at the pocket seam of the garment. The defense was that the use of rivets to strengthen seams was very old and well known; therefore a patent could not be sustained specially for securing pocket seams in that way. Issue was joined, 475 pages of lawyers' briefs were prepared, 528 witnesses were examined, and 3,361 pages of printed testimony were taken. Judge Blatchford, of the U. S. Court, sustained the patent. Let no man now rivet his pocket seams without first opening his wallet and paying toll.

ARE RIVER WATERS SAFE?

A very interesting discussion lately took place before the Chemical Society of London, concerning the comparative purity of river waters, into which town sewage was allowed to empty, and concerning the use of such waters for domestic purposes. The discussion was occasioned by the reading of a very able and exhaustive paper by Prof. Tidy, descriptive of his elaborate experiments showing the rapid oxidization of various deleterious substances when introduced into running waters. He also cited many examples of the rapidity of this oxidization in natural river waters, whereby immense quantities of sewage were, during a flow of only a few miles, rendered inert by oxidization, and such river water rendered fit for domestic use. Indeed, we have near New York an example of this. The city of Jersey City is supplied by water taken by pumps from the Passaic River, at Bellville, a few miles below the city of Paterson, N. J. The river receives a large part of the sewage of Paterson, also the refuse stuffs of many manufacturing establishments, but during its short flow to Bellville these bad matters, so eminent chemists have certified, are so rapidly oxidized as to become inert or changed, rendering the water pure enough for city people to swallow; and they are now drinking lots of it in Jersey City.

In the discussion alluded to, Dr. Frankland combated the views of Prof. Tidy, and claimed that the latter was wrong in his proposition about the rapidity of the oxidization; that sewage was not got rid of in that easy manner; and he adduced many proofs showing that no such purification and change in river water took place as had been alleged by Prof. Tidy. The discussion closed in the following interesting manner:

The president, Prof. Roscoe, said that all must compliment Dr. Frankland on the complete, clear, and withal, good natured criticism, to which they had listened with so much interest. He would ask Prof. Huxley to say something on the subject of bacteria.

Prof. Huxley did not wish to take part in the chemical controversy, but it had struck him on reading over Dr. Tidy's paper that there was a good deal of what he might venture to call "biological turbidity" in it. To this turbidity he would, as far as was in his power, act as a filter. He would state briefly only what were demonstrable facts. Diseases caused by what people, not wisely, call germs, *e. g.*, splenic fever, pig typhoid, etc., are caused invariably by bodies of the nature of bacteria; they could be cultivated through twenty to thirty generations, and then when given to the ox or the pig would invariably give rise to the characteristic disease. We have no reason even to imagine that any body capable of causing disease by such means could be anything but a body having the nature of a bacterium. Now, bacteria are just as much plants as mushrooms or cabbages, or the *Wellingtonia gigantea*, so that we know under what conditions bacteria can live and what they will do. Bacteria can be sown in Pasteur's solution just as mustard and cress can be sown in the soil; in it they thrive, and the liquid becomes milky, and he would ask the president whether there was any known method by which, if one drop of this Pasteur's solution were placed in a gallon of water, its constituents could be estimated. (The president having answered that he thought it was doubtful, the speaker continued.) Every cubic inch of such water would contain 50,000 to 100,000 bacteria, and one drop of it would be capable of exciting a putrefactive fermentation in any substance capable of undergoing that fermentation. For purposes of public health, the human body may be considered as such a substance, and we may conceive of a water containing such organisms, which may be as pure as can be as regards chemical analysis, and yet be as regards the human body as deadly as prussic acid. I am aware that chemists may consider this as a terrible conclusion, but it is true, and if the public are guided by percentages alone, they may often be led astray. The real value of a determination of the quantity of organic impurity in a water is, that by it a very shrewd notion can be obtained as to what has had access to that water. If it be proved that sewage has been mixed with it, there is a very great chance that the excreta of some diseased person may be there also. On the other hand, water may be chemically gross and yet do no harm to any one, the whole source of damage being, in the belief of the speaker, in the diseased germs. As to the bursting of the envelopes by endosmosis, it was a question whether they had any; bacteria would be large if one-twenty-thousandth of an inch in diameter; moreover, ordinary water was full of them, and in it they could be shaken for an indefinite period without harm. As long as bacteria had nutrition, there was no reason to suppose that oxidation or endosmosis would affect them. If, however, they were deprived of nourishment and exposed to sunlight the case might be very different.

The secretary then read a few remarks which had been sent by Dr. Mills. Dr. Mills has calculated the ratio of

$$\frac{\text{Oxygen consumed}}{\text{Sum of organic C+N}}$$

and finds that it is not constant but varies in different streams. He does not think it possible to determine the peat in a water by its tint depth, owing to the difference of color. River water commonly contains a slimy or pectinous material, which tends to separate out on any substance which acts as a nucleus. This has, in the author's opinion, a most potent influence on the purification of river water. The oxygen theory of the natural purification of waters seems utterly untenable. The criticisms of the author coincide in several respects with those already advanced above by Dr. Frankland. In conclusion the author expresses his admiration of the patience with which Dr. Tidy has collected his facts, and of the meritorious accuracy of his analytical results.

Prof. Tidy, in his reply, relied mainly on the powerful testimony given in his behalf by the statistics of the last ten years. Notwithstanding the possible contamination of a large bulk of river water by a minute drop of a fluid containing germs, yet there were as many cases of fever in towns supplied solely by well water as in those supplied by river water; this holds good for towns all over England as well as in different districts of the same town. He took exception to the laboratory experiments of Dr. Frankland on oxidation; they were doubtless most interesting and satisfactory experiments as regards shaking fluids up in bottles, but they did not represent the flow of a river; there was no vegetation, no animal life. As regards the diminution of sodium chloride in the Severn, he contended that plants did cause a decrease in the quantity of sodium chloride in running water. As to the Shannon, he knew every inch of it, and perfect streams of black drainage entered into Loch Derg and elsewhere quite sufficient to account for the discrepancies noted by Dr. Frankland. He collected the samples of water himself, and did his utmost to collect them fairly. He had no interest whatever in commending any water. In conclusion, Prof. Tidy said, that although his paper might be considered in some respects an attack on Dr. Frankland, he wished to thank him for the freedom and the kind way in which he had met him at every turn, and expressed a hope that Dr. Frankland would join him in fighting the prevailing heresies on this question which tended so to upset the public mind.

ELECTRICAL PAVEMENTS FOR CITY LOCOMOTION.

The latest suggestion for the use of electricity as a motive power is to have the streets of cities paved with iron, either in blocks or so arranged that the pavement will form continuous electrical conductors, divided into suitable sections, each section to be charged with electricity by a stationary steam engine and dynamo machine of proper size. On the electrical pavements thus provided, wagons, carriages, fire engines, omnibuses and other vehicles, each provided with an electrical driving wheel, and taking electricity through the wheel from the pavement, may be run, in any desired direction, with more ease and certainty than by the present system of horse locomotion, although that system would not necessarily be interfered with, as those who preferred to use horses could of course do so. Iron pavements could doubtless be made that would be quite as serviceable as the present stone blocks. The subject presents a fine opportunity for students of electricity to exercise their head gear.

Skin Grafting from the Dead.

Dr. J. H. Girdner, house surgeon at Bellevue Hospital, has obtained some remarkable and valuable results in skin grafting during the past year. One patient who required such treatment refused to furnish grafts from his own arms or body, owing to the pain involved; and, unwilling to ask another to subject himself to a pain which the person to be benefited was unwilling to submit to, Dr. Girdner tried the experiment of taking skin grafts from a corpse. The doctor says:

"I cut a piece of skin from a patient who died in the wards a few hours before, first taking care to inquire whether the cause of death was due to a poisonous disease or not. I then cut the cuticle into small pieces, which I laid on the granulated surface of the ulcers, and bandaged the leg up very firmly. In three days the graft began to show signs of life, a perfect union having taken place, and in a week a splendid skin, smooth and elastic, had grown over the ulcerated part, making a complete cure and leaving no scar behind. Since that time I have treated upward of fifty cases with invariable success. I have grafted the skin of an Irishman on a negro, and I have grafted the skin of a negro on an Irishman with ease. In both cases the skin lost its original color and changed its hue to suit the wearer.

Slave-Making Ants.

It may interest such persons as take pride in physical prowess to know that on the battle field ants distinguish themselves quite as signally as do human beings. Mrs. Mary Treat, in the *American Naturalist*, thus describes a contest which she witnessed between slave-making ants and black ants: The former were the aggressors, and victorious. The two columns were one hundred and twenty feet apart. An idea of the numbers constituting the ranks of the slave-makers may be gathered from the fact that on the war path, one hundred and twenty feet in length and a foot wide, they "were not thinly scattered, but a vast moving phalanx." The blacks, a grand army on their own territory, would not flee. The battle field was about twenty-five feet in circumference. A roar, announcing the beginning of hostilities, lasted for five minutes, "whereas the battle lasted four or five hours before the reds gained possession of the vast nurseries of the blacks," and it took two days to carry the pupæ and prisoners to their own dominions.

The Indestructibility of Matter.

This is capable of ready demonstration by preparing a couple of glass tubes of equal weight, each being filled with pure oxygen, and containing a few particles of carbon, free from appreciable amount of ash; that prepared from the fine loaf sugar gives very good results. The tubes are of precisely equal weight, and are hermetically sealed. By heating one of them the charcoal is caused to burn, and ultimately to disappear; the tube and contents, however, is of course found still to balance the other tube (which has not been heated), being of precisely the same weight as it was at first.

Earthquake Warnings.

In a recent lecture on the possibility of foretelling earthquakes, Professor Palmieri expressed the belief that by means of seismographic stations, telegraphically connected, for registering and reporting preliminary earth tremblings, it would be possible to foretell earthquakes just as tempests are now foretold, and to issue warnings to threatened districts about three days in advance. He did not expect to live to see such a system in operation, but he hoped and in a measure expected that posterity would be benefited by its universal and permanent establishment.

The Watch Trade of the United States.

The Watchmakers' and Jewelers' Guild of the United States held a convention in Chicago the second week in May. In his address, as President of the Guild, Col. R. E. P. Shurley said that the demands of the trade now amount to 3,000 watches a day. Of this number the large manufactories of the United States produce 1,530 a day, as follows: The Waltham factory, 750; the Elgin, 500, Springfield, Ill., 80; Hampden Watch Company, 90; Howard, 20; Lancaster, 50; Rockford, 40. The number produced by smaller establishments was not estimated. The great body of American watchmakers are native born.

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MISCELLANEOUS INVENTIONS.

An improved apparatus for cooling cube sugar has been patented by Mr. John V. V. Booraem, of Brooklyn, N. Y. The object of this invention is to furnish an apparatus for cooling cube sugar after it has been dried, so constructed that the sugar may be thoroughly cooled quickly and before the cubes have had time to stick together.

Mr. Peter C. Freese, of Cayuga, N. Y., has patented an improvement in vehicle springs, which consists of two tri angular frames, upon which the body of the carriage or wagon rests, and each of the frames has a ring at the point, and through these rings a stirrup passes, this stirrup being at the end of a rod adjustably secured to the under side of the seat, which rests on springs, so that the seat rests entirely upon the springs.

Mr. Herrmann Wojan, of Golden's Bridge, N. Y., has patented an improved ox-bow fastener which is simple and convenient. The fastener is formed of two annular plates, between which an adjustable lever is pivoted eccentrically. It is acted upon by a cam lever, also pivoted between the two plates.

An improved hame tug, patented by Mr. Samuel R. Copeland, of Armstrong, Ill., consists in a novel construction and combination with the trace or tug of a metallic skeleton frame or keeper, provided with means for holding the trace securely in place and for adjusting it at pleasure to suit different animals.

An improved apparatus for drying fruit and vegetables by heated air, which has for its object to perform the drying rapidly, uniformly, and conveniently, has been patented by Mr. Jesse H. Burks, of San Luis Obispo, Cal.

Mr. Luke Davis, of Boston, Mass., has patented a fan attachment for elevators, which consists of a fan fixed in an elevator car having on one end a sheave, around which a turn is made of a rope that is stretched taut from the top to the bottom of the elevator shaft or well, so that as the car moves up or down the fan is revolved and creates a current of air to ventilate the car or shaft.

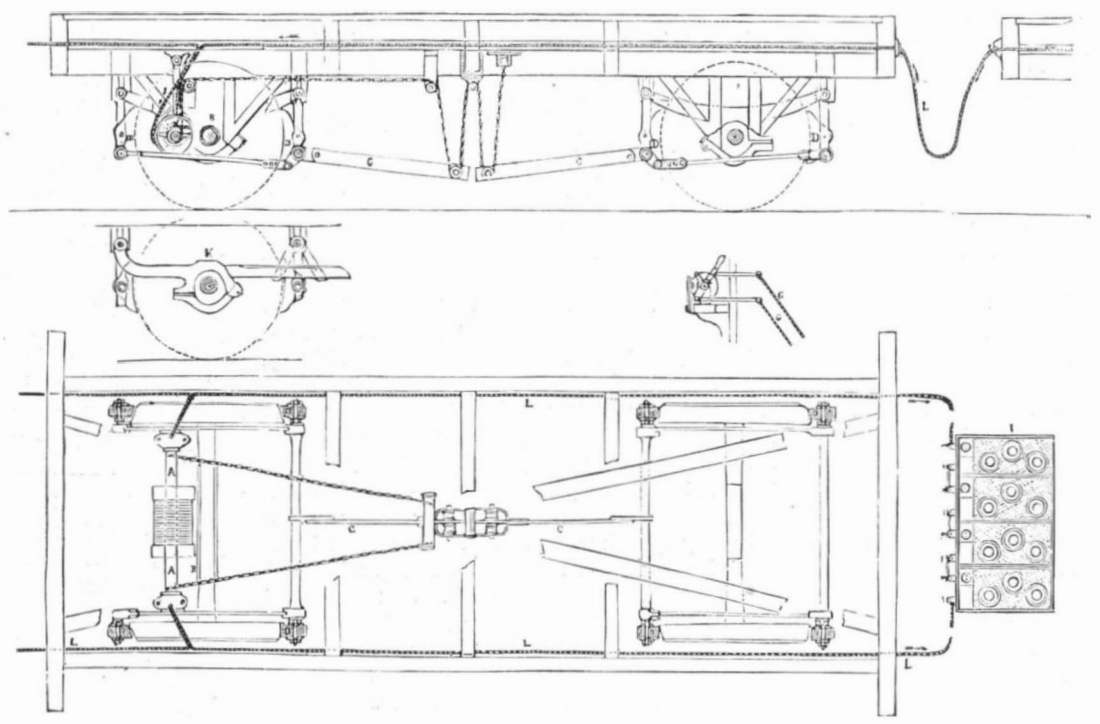
Mr. John F. McCoy, of Beverly, N. J., has patented a tire-upsetter, so constructed that it may be used upon an anvil. It is simple in construction and convenient and effective.

An improved cigar bunching machine has been patented by Mr. Moses Greensfelder, of Baltimore, Md. The invention is embodied in organized mechanism for laying a binder, filling in, rolling up the filler, depositing the bunch in the mould, and shifting the mould automatically. The details of construction and operation of parts cannot be clearly described without the aid of engravings.

ELECTRIC BRAKE FOR RAILWAY CARS.

In view of the tremendous speed attained by railway trains, it is a matter of the greatest importance to procure safe, reliable, and powerful brakes, which can be controlled from the engine or any other part of the train. Mr. Achard has invented a new and very ingenious electric brake, which is illustrated in the annexed cut taken from *La Nature*. Two Planté secondary batteries, each charged by three Daniell elements, are arranged on the first car, and two like batteries are provided in the last car. In the engraving the four secondary piles are united, but that does not affect the working of the device.

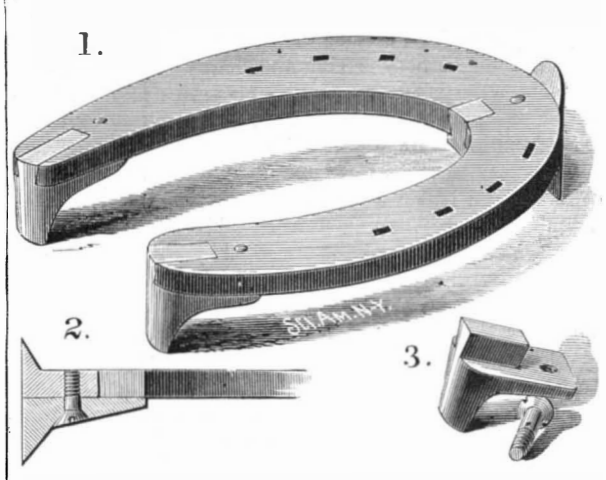
The current of the secondary batteries is conducted to the brakes of each wheel, the two wires running parallel with the train, with which wires the electro-magnets of the brakes are connected in such a manner that the brake operates when the circuit is closed. The electro-magnet, A, is rigidly mounted on a shaft suspended opposite the axle, B. If the current passes through the electro-magnet it is with great force drawn toward a sleeve, rigidly mounted on the axle, B, and is held against it with sufficient force to cause it to rotate with the axle, thereby winding the brake chains upon the shaft of the electro-magnet. The long arms of the articulated levers, C C, are raised by the winding up of the brake chains, and the brake shoes, D D, connected with the short arms of the levers, C C, are pressed against the tires of the wheels with great force. A brake shoe is provided on each side of the wheel so as not to break the journal box by undue pressure. To release the brakes it is sufficient to break the circuit, upon which the electro-magnet is released from the axle, B, and the chains are unwound. The commutator, H, is used to close or break the circuit, and may be located in the caboose of the engineer, in the last car or at any other convenient part of the train. The brake operates instantaneously, and sometimes produces such shocks that Mr. Achard has found it necessary to interpose resistances in the circuit to weaken the current proportionately During the experiments made with this brake, on the Northern Railway of France, a train of thirteen cars, with a speed of forty-five and a half miles per hour, was stopped in twenty-one seconds and within a distance of seven hundred and five feet.



ELECTRIC BRAKE FOR RAILWAY CARS.

IMPROVEMENT IN HORSESHOES.

Our engraving represents an improvement in horseshoes recently patented by Mr. Gelos L. Potvin, of Alpena, Mich. Lumbermen, contractors, horse-railway companies, and others who, in the prosecution of their various enterprises, employ large numbers of horses, are only too well aware of the great expense attending keeping their horses well shod under the present system of farriery, not only in the amount of shoes used and the labor to reset them, but in the valuable time lost in having the animals shod, and the loss by laming many valuable animals caused by the necessity of taking off the shoes every time a calk becomes worn out or broken, thus requiring the hoof to be pared down till scarcely anything remains to nail the shoe to.



POTVIN'S IMPROVED HORSESHOE.

This invention is designed to obviate the necessity of taking the shoe from the horse's foot when it needs recalking.

It will be admitted that if a teamster can recalk a set of shoes in ten minutes on the road, in the woods, or in the barn, he will have made a saving for his employer.

Fig. 1, which is a perspective of the shoe, shows the extreme simplicity of the improvement. In the heels of the shoe there are slots in which the dovetail studs of the heel calks fit snugly; the toe calk is set in a similar manner, and each calk is secured by a screw, as shown.

Fig. 2 and Fig. 3 represent the calks in detail, and the screw used in fastening is shown in Fig. 3.

These shoes can be manufactured as cheaply as the ordinary ones, as the calks can be made of malleable iron and case-hardened. The plate will outwear a dozen shoes of the ordinary make, being almost entirely protected by the new calks that are put in from time to time.

The inventor states that a set of shoes can easily be recalked in ten minutes, and claims that it will save over fifty per cent of the horseshoeing bill to the owner every year

For further particulars apply to Gelos L. Potvin, patentee and inventor, Alpena, Alpena county, Mich.

The Preservation of Fruit by Burial.

Last January a California fruit dealer took two hundred fresh lemons fresh from the tree and buried them in the ground, to see how they would keep. Four months after he dug them up and found them in perfect preservation, as sound and fresh and nice as the day they were buried. Every one knows how well potatoes keep when properly covered by earth. Apples would doubtless do equally well; and possibly the same method may answer for grapes and other more perishable fruit. It would not cost much to try a few experiments in this direction, and success could not fail to be advantageous.

Silvering by Cold Rubbing.

Make paste by thoroughly grinding in a porcelain mortar, out of the light,

Water	3 to 5 oz.
Chloride of silver	7 oz.
Potassium oxalate	10½ oz.
Salt (common table)	15 oz.
Sal ammoniac	3¾ oz.

Or,

Chloride of silver	3½ oz.
Cream of tartar	7 oz.
Salt (common)	10½ oz.
Water, to form a paste.	

Keep in a covered vessel away from the light. Apply with a cork or brush to the clean metallic (copper) surface, and allow the paste to dry. When rinsed in cold water the silver presents a fine frosted appearance, the brightness of which may be increased by a few seconds immersion in dilute sulphuric acid or solution of potassium cyanide. The silvering bears the action of the wire brush and of the burnishing tool very well, and may also be "oxidized." Should a first silvering not be found sufficiently durable after scratch brushing, a second or third coat may be applied. This silvering is not so adhering or white on pure copper as upon a gilt surface.

For the reflectors of lanterns the paste is rubbed upon the reflector with a fine linen pad; then, with another rag, a thin paste of Spanish white or similar substance is spread over the reflector and left to dry. Rubbing with a fine clean linen rag restores the luster and whiteness of the silvered surface.

The paste is sometimes mixed directly with the whiting and left to dry, or until nearly dry, then rubbed down as described.

Transplanting American Oysters.

Recently 1,250,000 American oysters were laid down on the coast of Little Celt, from Gravenshoved to Polkhoved, and a company has been formed to lay down 15,000,000 more on the Schleswig Holstein coast. There have been several attempts to restock the exhausted British oyster beds with American oysters, but they have invariably failed through improper placing or bad handling. The Dutch oystermen may do better.

The Purification of Rivers.

The prize offered by the King of Saxony for the best practical scheme for rendering harmless to fish in rivers and lakes the refuse from factories and sewage of towns has brought before the public two precipitation processes, among others, in which lime is the chief agent. One of the schemes is that of Herr Willhelm Knauer, in which the sewage is heated and then saturated with lime water, and precipitation being thus effected, the water enters another tank with chlorate of magnesia, and is ultimately filtered through gravel and earth. A remarkable scheme is that of Brigadier General W. Heine. Under this process the water, also sufficiently saturated with slaked lime, has to pass through several tanks and canals until it is pumped up to a tower, from which it descends in the form of rain, the sulphuric steam with which the interior of the tower is filled occasioning a crust of ammonia on the walls. This plan, it is said, is now being tried under the authority of the Saxon Minister of the Interior on the Elster, a river very much polluted by various factories on the Saxon frontier. The objection urged against these processes are that lime has a tendency hurtful to fish life, and leaves an offensive and worthless deposit, while the effluent water, being in an alkaline condition, is liable to putrefaction upon its introduction into the river. The effluent from the A B C process, as carried out at Aylesbury, with the help of sulphate of alumina, is, on the other hand, acid, and, therefore, not open to the same objection as the alkaline processes, while the deposit is a valuable and inoffensive manure.

An alloy of rhodium and lead, lately exhibited before the French Academy of Sciences, has the curious property of exploding on exposure to heat, as in being held before a gas flame. Its composition is one-third rhodium and two-thirds lead, fused together in a crucible, at a high temperature.

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PNEUMATIC CLOCKS.

Compressed air, which has for some time past formed an important factor in mining, diving, marine engineering, locomotion, and analogous uses, has lately been utilized in a very ingenious manner in operating all the clocks of a city or district simultaneously. Some time since we gave an illustration and description of a pneumatic clock exhibited at the Paris Exhibition and in public use at Vienna. The entire mechanism of a pneumatic clock system, as in use at present at Paris, consists of three distinct parts: the central clock, the receiving clocks, and the tubes for conveying compressed air to the several receiving clocks. At the central station air is compressed to a pressure of about five atmospheres by means of a double piston compressor, and is stored in a large tank of about twenty-five cubic feet capacity. From this main reservoir the compressed air is conducted into a second reservoir, in which its pressure is regulated at seven tenths of an atmosphere by means of a very simple automatic contrivance. Every minute this distributing reservoir is placed in communication with the distributing tubes by means of a distributing clock, shown in Fig. 1.

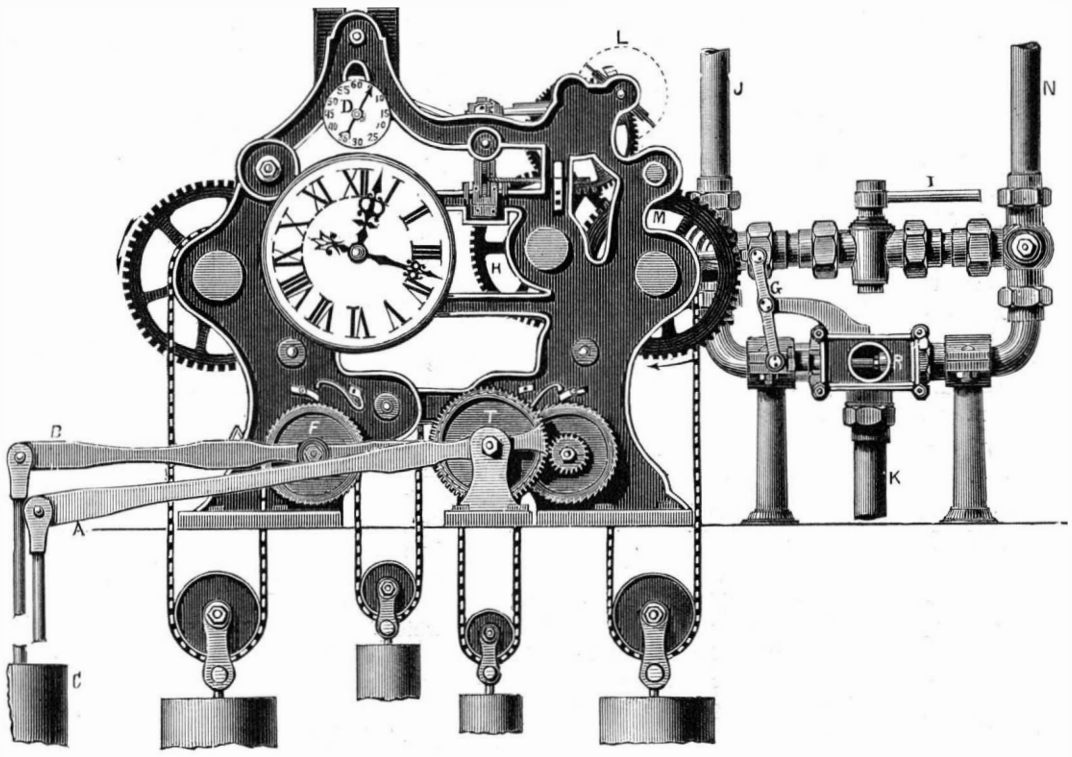

Fig. 1.—DISTRIBUTING CLOCK.

In the annexed engravings, which we take from *La Nature*, the works on the left hand side are those of an ordinary clock, and the mechanism on the right hand side operates the distributing slide valve, R. The second dial of this clockwork is at D. At the beginning of every minute the compressed air from the distributing reservoir is admitted into the distributing box through the tube, J, and is conveyed to the distributing tubes by the tube, N. After about twenty seconds a movement of the lever, G, places the slide valve into its second position, and the tube, N, is in communication with the tube, K, which opens into the air, when the tube, J, is then neither in communication with the tube, R, nor with N. The slide valve, R, rests in this position for forty seconds, that is, until the minute is completed, when another displacement, as described above, establishes a communication between J and N. The compressed air is also used to wind up the weights of the clockwork, by means of the cylinders, C, and levers, A and B, as shown in Fig. 1. The slide valve, R, which may be replaced by a three-way cock, I, is actuated by the clockworks, which are adjusted and regulated every day or hour from the observatory. The central station is provided with duplicate apparatus, so that if one distributing clock is out of order or disturbed in any way the other can be set in operation in a few seconds. The tube, N, is connected with the several mains which convey the compressed air into the various districts or precincts into which the city is divided. The mains are made of wrought iron, are about one and one sixteenth of an inch in diameter, and are connected with lead tubes three fifths of an inch in diameter, for conveying the air into the houses. The tubes leading to the several stories are one quarter inch in diameter, and are connected with lead or rubber tubes one eighth inch in diameter, communicating with the several clocks and preferably colored the same as the wall paper or woodwork of the room, so as not to be easily perceptible. With a pressure of seven tenths of an atmosphere, and permitting the compressed air to pass through the tubes for twenty seconds, any number of clocks can be operated at a distance of one to two miles from the central station.

The mechanism of the receiving clocks, shown in Fig. 2, is alike in all cases, and is entirely independent of the size of the dial or the location of the clock. A small bellows, resembling that used in pneumatic call bells, is in communication with the tubes conducting the compressed air from the central office. Every minute the pressure of the air raises the bellows, and a rod attached to the upper bellows-head actuates a lever which engages with a wheel provided with 60 teeth, which is rigidly secured to the minute hand arbor. The wheel rotates the distance of one tooth every minute, and a weighted pawl on the other side of the dial checks this movement. The hour hand is rotated by means of the usual dial wheels. By means of a second bellows the clocks may be arranged to strike. The ordinary spring and weight clocks can be easily transformed into pneumatic receiving clocks.

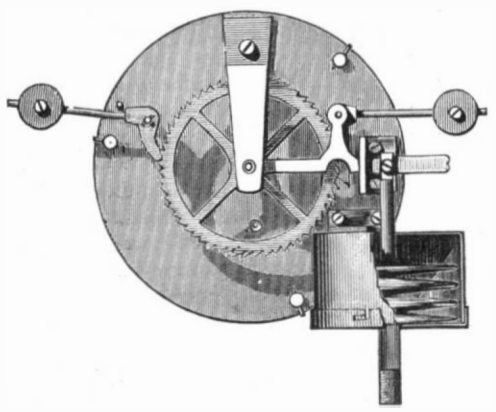

Fig. 2.—RECEIVING CLOCK.

Many of the principal hotels, railway stations, public offices, courts, etc., of Paris, are provided with the pneumatic clock; and public pillar or street clocks, which are illuminated at night, have been erected in several parts of the city. We are informed that a company has been organized in the city of New York for the purpose of introducing the pneumatic clocks into this and other cities.

Fig. 3.—STREET CLOCK.

ENGINEERING INVENTIONS.

Messrs. Youngblood & Holmes, of New Orleans, La., have patented a simple device for preventing the collection of scale on the crown sheet of a boiler. It consists of a pan arranged immediately over the grate bars on the bottom of boiler, and partly covered and provided with discharge pipe to prevent the deposit of scales on the boiler sheet and carry them into the mud drum.

Improvements in the construction and arrangement of the devices for opening and closing the lock gates and sluice gates of canal locks, have been patented by Mr. Thomas Milette, of Three Rivers, Quebec, Canada. The object of these improvements is to facilitate the working of the gates and to furnish a water way or sluice under the floor and lock gates for the entrance and emission of the water.

Mr. Charles A. Read, of Bridgeport, Conn., has patented an improved water meter and motor, which is so constructed as to run with little friction, to be sensitive to the least motion of the water, and to have very little leakage.

Mr. Henry Case, of Brooklyn, N. Y., has invented an improved apparatus for sinking and removing piles. It consists of one or more tubes with suitable couplings, by means of which forced currents of water may be made to create auxiliary currents to act directly upon the submarine bottom beneath and about piles or other objects, so that the sand, mud, gravel, etc., are washed away, allowing the pile or obstruction to sink or admitting of its being more readily raised.

Mr. Samuel L. Marsden, of New Haven, Conn., has patented an adjustable device for correcting and compensating the wear on the pitman bearings, toggle bearings, toggles, and movable jaw or jaws of stone breakers and crushers like that of Blake and others. The invention consists of an adjustable toggle block provided with a rounded convex or concave back, and of a toggle block wedge provided with a concave or convex face, in which concavity or convexity the back of the toggle block fits, the said toggle block being vertically adjustable by means of a screw or screws, and being capable of a laterally rocking motion because of its articulation with the toggle block wedge. This invention

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is designed to compensate both for the direct and angular wear.

Mr. Henry Case, of Brooklyn, N. Y., has patented a breakwater that combines lightness, durability, cheapness, and effectiveness. The invention consists of a latticed or perforated sloping roof supported on piles that project above the water line, and of gratings fixed between the piles and extending above and below the water line on the sea front of the breakwater, the said structure being protected from injury from floating ice and other objects by spring piles, and further protected and secured by chains that, on the sea-front, are loosely stretched from the structure itself down to supplementary piles that are sunk entirely below the water line, the said spring piles and supplementary piles and chains forming part of the device.

AMERICAN INDUSTRIES—No. 48.

THE MANUFACTURE OF VULCANIZED RUBBER FABRICS.

Volumes have been written about the early history of the rubber manufacture, and the experiences of the great inventor who made its success his life's work. But those already familiar with this remarkable record will always have an appreciative ear for a brief reference thereto, while the generation which has arisen since the final triumph of Charles Goodyear was in everybody's mouth may be impelled thereby to study more closely a narrative of such surpassing interest to all mechanics. Among inventors and patentees especially, the thrilling story will ever awaken profound attention: how this yellowish white sap of a tropical tree, turned to gum by evaporation—originally called India rubber because it came from India and was used to *rub* out pencil marks—had baffled the efforts of the leading scientists of the world by its singular chemical properties, only to be at last worked up by an American mechanic into a substance adapted to a greater variety of uses than almost any other product of man's skill; with what untiring zeal and through what manifold difficulties he labored many years for what practical men deemed a chimera; the expensive litigation to which he was put to defend his patents when success had been fairly won, so that even the award of the gold medal at Paris, in 1855, accompanied by the Grand Cross of the Legion of Honor, found him in a debtor's prison—down to his final triumph in "the great India rubber case," when the legal declaration of his rights was finally reached through the last efforts in public life of Daniel Webster, but a few weeks before the death of the latter at Marshfield—all of these details, trite as may be the facts to many men now in middle life, can never fail to come home with touching eloquence to every American citizen, and to her mechanics and artisans especially.

The industry of which the manufacturing details are represented in our first page illustrations this week, from sketches taken at the works of the New York Belting and Packing Company, at Newtown, Conn., is one of the monuments of Charles Goodyear's success. This is the largest manufactory of the kind in the world, and the making of vulcanized rubber fabrics adapted to mechanical purposes is here carried on in a way which indicates the full fruition of his anticipations, whether we consider the quantity and variety of goods made, or the highly important relations which these productions hold to all industrial pursuits, for in many cases they meet wants never before satisfied, and fit needs for which no equally good substitute could be devised. The articles regularly manufactured at this factory include bands or belting for running machinery, from the largest belts ever made down to the smallest sizes in use; packing, to make tight joints in pumps, engines, etc., where the work is either in water, steam, or compressed air, together with a variety of valves, gaskets, and rings for similar use; hose for fire engines and watering gardens, besides heavy steam and brewers' hose; wagon and car springs, gas tubing, solid vulcanite emery wheels, corrugated matting and mats, cushions for billiard tables, etc. A full list of their productions would, indeed, make a formidable catalogue, but the interest therein to the general reader would be enhanced by the reflection that in so few years a comparatively unknown substance had come to play so important a part in our industries.

In giving a description of the process of manufacture, the first consideration is the condition of the crude material as it reaches the factory. Raw rubber comes from South and Central America, Africa, and the East Indies, but the principal supply for the United States, and the highest priced article, is from Para, at the mouth of the Amazon. The trees which furnish it are large, and are tapped much in the same way as we do the sugar maple here. The sap, which has a milky appearance, being collected in large quantities, flat wooden forms of various shapes, but about one foot across, are dipped into it, and then dried in the dense smoke made by a fire from a kind of nut found abundantly there. This operation is repeated until the successive layers make a coating about an inch thick, when they are cut from the wooden forms and the raw rubber is ready for market. Different kinds of cure are adopted in other places, so that the rubber is not so much discolored, but the impurities contained in raw rubber usually amount to about 20 per cent of its weight. The first operation at the factory, therefore, is to cut and tear it up, and, after soaking in warm water, carefully wash and clean it, when it must be thoroughly dried; it next goes to the mixing department, where, by repeatedly working it over, sulphur and the oxides of various metals are incorporated with it; the rubber, now in the form of rough and jagged sheets, passes to powerful calendering machines where it is pressed into smooth and regular strips or sheets as long or short or as thick or thin as may be desired for the various uses to which it is to be put. In this shape it is ready to be worked into belting, hose, packing, and all varieties of articles made, but while it is in this condition the ultimate shape of the fabric to be produced must be given it. The final operation is the vulcanizing, or tempering, in immense heaters, where the degree of heat and time employed must be very carefully regulated. In fact this principle has to be kept well in mind during all the preceding operations, the grinders, rollers, etc., being all hollow cylinders, steam heated according to the requirements of the special work in hand.

In our illustrations the titles of the several views will enable the reader to clearly distinguish the respective operations. The "washer and sheeter," as shown at the top of the page, represents a large vat where the rubber is cut into small pieces by a wheel with numerous sharp knives revolving in the water, which at the same time knead the rubber, something after the manner of preparing pulp in paper making. By this process all dirt and foreign substances are expelled, leaving only the pure rubber, which next goes to the sheeter in small fragments, loosely adhering together. The view shows only one of several powerful machines employed, which consist of large hollow cylinders of cast iron revolving in opposite directions, by which the rubber is pressed and kneaded into thick sheets or mats. Unless the rubber appears to be exceptionally clean, it is, previous to the washing, passed through another machine, not shown in our illustrations, and known as a "cracker." This machine has large, deeply-grooved iron cylinders, which revolve in pairs, slowly and heavily, grinding the tough rubber and driving out bark and dust, while they also stretch it so that other foreign substances drop out.

The rubber having been thus thoroughly cleaned and left in the form of rough sheets, must be hung up for a considerable period to dry, after which it goes to the mixing machines, as shown in the adjoining picture. In this department the character of the product to be produced is principally determined, for the different varieties of rubber for particular uses have each their several mixtures, according to what experience has demonstrated to be the best. The various substances here incorporated with the rubber include sulphur, the oxides of lead, zinc, iron, etc., the proportions differing for each class of goods, and each particular compound calling for a treatment adapted thereto in the after stages of manufacture. The value of long experience in the business, and a thorough acquaintance with all that science can teach in relation thereto, is here most signally appreciated. The workman has his box of mixture furnished him by weight, just so much for a given quantity of rubber, and then, taking the rough sheets as they come from the drying room, he passes them between the heated iron cylinders of the mixing machine, slowly feeding in, also, the mixture which is to be incorporated with the rubber. The same sheet is passed through many times, until the compound has been thoroughly and evenly worked into it, the degree of heat at which the cylinders are kept being all the while closely regulated.

After this process the rubber goes to the calendering department, one of the large machines for which is shown to the left at the bottom of the page. These are heavier than calendering machines generally, and the one represented is the largest ever made for this purpose. The rollers are hollow, and so fitted up for steam heating that the temperature can be kept as desired. The rubber is here rolled a great many times, some of it being passed through in sheets and strips, pure, and some with the rubber pressed upon a web of heavy cotton duck, previously coated with rubber driven through and through its meshes by powerful machinery. The fabric used for this purpose is made expressly for the establishment, so as to give it more than double the strength of the heavy cotton duck used for sails for ships. The cotton fabrics thus combined with the rubber give the belting and hose thus made their great tensile strength, which, in hose, where the tests can be most accurately made by gauging the exact pressure to the square inch, has been proven to be about twice that of leather.

For belt making, the rubber coated and impregnated duck is taken to a large department where this branch of the business is carried on, and unrolled upon tables one hundred feet long, where the workmen cut it accurately to the required width. One strip is cut so that, folded, it will make the width of belt, and another so that the wide strip will just fold over its edges and meet in the middle, which makes a three-ply belt. In this way the strips are passed between a series of powerful rollers, the temperature of which is evenly regulated, as in all the other operations; the folding over at the sides makes an even and perfectly regular edge, and at the middle, where the edges of the outside strip come together, a narrow ribbon of rubber is fed to cover exactly the line of meeting. In this way the entire outside of the belt is pressed by the heated rollers into an even, regular surface.

The thicknesses of the regular sizes of rubber belts for most machine work are three-ply and four-ply, although two-ply belts are also made. The three-ply is generally compared with the heaviest single leather belts, and the four-ply with double leather belts. In making four-ply rubber belts, or in heavier ones when ordered, the width of the outside strip is calculated according to the two or more thicknesses over which it must be folded, and the operation then proceeds as in making the three-ply.

As the rubber surfaces, before being vulcanized, would stick together, they are rolled up with a thickness of duck between, and the rolling machine has an attachment which rolls up this fabric as the machine is fed.

Our engraving gives but an incomplete idea of the room which these operations take up, for the long lengths of belting which have to be prepared previous to going into the machine have then to be carried forward into the vulcanizing heater, and this operation must be continuous from the commencement until the vulcanizing process is complete. The company is now making an elevator belt thirty-six inches wide and half a mile long, which will weigh over eighteen thousand pounds. All of the great grain elevator belts in the country are of rubber, and the company have some of their big belts in Chicago elevators which have been running perfectly for twelve years. The metallic compound with which the rubber for belts is prepared gives its surface a high degree of firmness, while there is yet sufficient elasticity to allow of its hugging the pulley closely, which all machinists understand is necessary to enable a belt to work well; in the compound, also, as well as in the vulcanizing, attention is directed to making a belt which will resist a high degree of heat, so that the surface may not be injured by friction. All mechanics will understand that in putting on belts they should be stretched as tightly as possible, and in large belts, where joints are strengthened by overlapping a thin piece of rubber or leather, the seam side should always be outside; the closer the contact of the belt with the pulley, and the more perfect the exclusion of air from between belt and pulley, the better the service.

For the hose-making department, the general features of which are represented in one of our views, the rubber has its different and particular compounds in the mixing machine, and in the calendering is united with the fabrics suited to the different kinds of goods made here. The lengths and widths required are cut much the same way as in the preparation of belting, and then fitted over cylinders of 25 and 50 feet in length, which are rolled against other cylinders to press together and make solid the laps and joints under a powerful pressure and the requisite degree of heat. These forming cylinders remain in the lengths of hose until the vulcanizing is completed. A great many kinds of hose are made, two-ply being the thinnest, and the sizes from half inch to 10 inches internal diameter; hydrant hose is three-ply, and ordinary engine hose, to stand a pressure of 100 to 150 lb. to a square inch, is four-ply. Their "test" hose, made on carbolized duck for fire-engine service, will stand a pressure of 400 lb. per square inch. The advantage of rubber hose over that made of leather, aside from its much higher tensile strength, lies in the fact that it requires no care, only to be hung up to dry after use, while leather hose must frequently be "stuffed" with oil and tallow, etc., after the manner a currier finishes leather, only the stuffing must be forced inside the hose, making the operation more difficult. For these reasons the use of leather hose is steadily being relegated to the small country towns where only hand engines are used and where the volunteer firemen have ample time to devote to leather dressing.

In addition to the above, the New York Belting and Packing Company manufacture suction hose, and steamer and brewers' hose, on spiral wire, one variety of which has the wire entirely embedded in the rubber, so that the interior is perfectly smooth.

The illustration showing where the square packing is made ready for vulcanizing gives only one of many different operations connected with this branch. The rubber is furnished in sheets and plates of different sizes and shapes for regular articles, either pure or with cloth insertion, but where irregular shapes and forms are wanted, which cannot be cut out of the standard products, they must be made in moulds, not cast, as many suppose, and the rubber, after having been prepared by mixing and otherwise, as in the other operations, must be pressed into the moulds. In this way the corrugated matting, stair pads, car springs, etc., are made. The demand for this packing in steam work, to pack around piston rods, and wherever there is a joint where the metal is subjected to different degrees of temperature, in valves, etc., is enormous, and only an engineer who has had experience with the materials formerly used for this purpose can fully realize its value for such use.

The making of gas tubes, shown in one of the views, presents no substantial difference in principle from hose making. This tubing is made either pure or with cloth insertion.

An important specialty of the business of the company is the making of solid vulcanite emery wheels, in which just enough rubber is used to firmly hold together the particles of emery. It requires powerful machinery to thoroughly work the compound into a homogeneous mass, after which it is rolled into sheets, cut into wheels of the desired size and form, and pressed into iron moulds, when it is ready for vulcanizing. These wheels are of the nature of stone throughout, and nearly as hard as cast iron. They can be used either wet or dry, but by allowing water to drip on them while in use their cutting properties will sometimes be improved, and dust will be avoided.

The concluding operation of all the above processes, however, is the vulcanizing, a representation of two of the heaters for which is given in one of the views. To leave off this portion of the manufacture, and this was the point which gave Charles Goodyear the most of his trouble—all the preceding labor would be thrown away. Each article made must have just so much heat and no more, and be subjected

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thereto for a certain definite time, the amount of heat and the time varying according to the mineral compound with which the rubber is incorporated. The heaters are, therefore, arranged with thermometers for gauging the temperature, and are made somewhat like steam boilers, some of them being 100 feet long; into these heaters run tracks on which long platforms, laden with articles to be vulcanized, are rolled in, and the steam is let on to raise and keep the required temperature. The great length of these heaters arises from the necessity of making long stretches of belting, and also from the amount of hose made in lengths of fifty feet.

In this connection considerable interest attaches to an immense steam press, the largest of its kind in the world which the company have recently completed, and which is shown to the right at the bottom of the page. This press will take a belt 6 feet wide, and 15 feet of its length, at once; it weighs 85,000 pounds; the steam is let into the bed and platen so that the temperature can be readily regulated; the platen is stationary, and the bed is lifted by hydraulic pressure. The most novel feature of this great press, however, is that it is arranged with appliances at each end for stretching the belts, so that, while the belt is under the full tension of the heaviest strain it may be desired to put upon it, it may at the same time be compressed between the hot plates, and thus set its fibers as firmly as a bar of steel. It does not seem very likely that an engineer would ever be troubled with having to "take up" a belt whose "stretch" had been taken out in this way.

The N. Y. B. & P. Company own the patent for this stretcher in combination with the press, as they do many other patents of great importance in the business. The principal Goodyear patent on vulcanizing expired in 1865, but this company had then been many years manufacturing, and had obtained subsequent patents for improvements, some of which are of great value in their present manufactory.

The offices, salesroom, and warehouse of the Company are at 37 and 38 Park Row, New York. John H. Cheever is the treasurer of the company and general manager of the business.

RECENT DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—Southern District of New York.

STRAUSS *et al. vs.* KING *et al.*—PATENT PANTALOONS.

The application of rivets to pockets for uniting and closing the end of the seam at the corners, as claimed in reissued patent No. 6,335, dated March 16, 1875, involves invention, is not a mere double use or aggregation, and is patentable.

Blatchford, J.:

This suit is brought on reissued letters patent granted March 16, 1875, to Jacob W. Davis and Levi Strauss & Co., for an "improvement in pantaloons," etc., the original patent having been granted to them May 20, 1873, on the invention of said Davis.

The claim of the reissued patent is as follows:

As a new article of manufacture, pantaloons or other garments having their pocket openings secured at the edges by means of rivets or their equivalents, substantially in the manner described and shown.

This case has been contested with great vigor. The bill was filed in November, 1876. Testimony was taken from May, 1877, to July, 1878. The plaintiffs examined two hundred and eighty-three witnesses, and the defendants one hundred and forty-five. The plaintiffs' proofs cover two thousand four hundred and sixty-five printed pages, and the defendants' one thousand one hundred and ninety-six. The plaintiffs' brief covers three hundred and twenty-three printed pages, and the defendants' one hundred and fifty-two. Infringement is not contested, but the defendants rely on want of patentability and want of novelty in the thing patented.

On the point that there is no invention in the thing patented the defendants contend that the want of patentability consists in the fact that the invention is nothing more than the employment at the corners of a pocket opening of the old and well known rivet, and that no new function is performed by the rivet in that place from what is performed by it in any other place. The invention is claimed as an improvement in the pocket opening of a garment which has a pocket opening. It does not extend to anything but a pocket opening. It requires that the seam which unites two pieces of cloth laterally shall terminate at the commencement of the pocket opening; that such seam shall be made by means of sewing the two pieces of cloth together laterally by thread; that the rivet shall be of metal; that it shall be placed in the seam at the edge of the pocket opening—that is, where the seam ends and the pocket opening begins, but still in the seam; that it shall be so located and fastened with reference to the two lateral pieces of cloth which the seam unites as to bind together such two lateral pieces of cloth by pressing tightly upon both of them; that this shall be effected by putting the rivet through a hole and heading it down on both of the two opposite faces where the hole begins and ends; that the operation of the rivet when so set shall be to receive the strain which results from pressure from within on the edge or end of the pocket opening and keep such strain from coming on the thread of the seam, and thus protect such thread from ripping or starting and allowing the seam to open, and that the practical advantage of the arrangement shall be to get rid of the frequent renewal by sewing of the thread in the seam at the edge of the opening. In view of the testimony as to the state of the art prior to the invention of Davis, all the foregoing features are involved in such invention. They all appear on the face of the specification of the patent and are embraced in the claim. They amount to invention and they embody patentability. The result of them was new and useful. The case is not one of mere double use or of the use of an old rivet in a new place. It is not merely the usual through-and-through binding or uniting function of the rivet that is availed of.

It is argued for the defendants that there is no combination between the rivet and the sewed seam, but a mere aggregation; that the claim is not confined to the application of a rivet to a sewed seam; that a stay of sewed thread is the equivalent of a rivet; that in view of the prior use of a stay of sewed thread at the corner of a pocket opening there was no invention in the change to a metal rivet, and that a button had before been sewed on with thread at the upper end of the seam, at the edge of the pocket opening, to prevent the thread of the seam from being worn away, and the seam had been stayed by sewing in leather or other fabric, and there was no invention in passing from these arrangements to Davis's. It is sufficient to say that there is no force in any of these suggestions as against the validity of the patent, nor is it shown that the invention as before defined was known or in use before it was made by Davis. The defendants, to defeat the patent on the ground of want of novelty, must make out the defense by satisfactory and preponderating proof. This they have not done. In coming to this conclusion I have considered the Magee coat, the Nightingale coat, the evidence grouped in the defendants' brief under the heads "Nevada (C)" and "Nevada (D)," the evidence of Stanton, Ford, Wilson, Richville, and Hogbin, the Orr overalls, the patent to Bowker, and the patent to Bellford.

There must be the usual decree for the plaintiffs.

The Voyage of the Anthracite.

The experimental steamer Anthracite, described in our last issue, arrived at St. John's, Newfoundland, June 21, eighteen days from Liverpool. The weather was boisterous throughout the trip, making the speed of the little vessel somewhat less than was anticipated. Only 20 tons of coal were consumed on the voyage, and 436 gallons of water—a practical demonstration, it is thought, of the economy of the Perkins' system of high pressure engines which was on trial. The Anthracite is the smallest steamer that ever crossed the Atlantic. Her total length is 84 feet; beam, 16 feet; and depth, 10 feet, her engine and boiler room being 22 feet 6 inches. Her gross tonnage is 70·26 tons, and her registered tonnage 27·91 tons.

Correspondence.

The Temperature of the Sun.

To the Editor of the Scientific American:

On page 405 of your issue of June 26, 1880, in the article entitled "What is the Temperature of the Sun?" I discover a singular error. Mr. Sawyer estimates the diameter of the earth's orbit to be 190,000,000 miles, and the diameter of the sun at 800,000 miles, the diameter of the orbit being 237·5 times the sun's diameter. He thereupon computes the surface of the imaginary hollow sphere of 190,000,000 of miles diameter at 237·5 times that of the sun, instead of using the *cube* of 237·5 as the multiplier. Correcting this error, Mr. Sawyer's figures would make the temperature of the sun 1,339,648,437°, which will hardly corroborate his first estimate, in which all the sums on which he bases his calculations are assumed. O. E. TOWN.

Washington, D. C., June 21, 1880.

What is the Temperature of the Sun?

To the Editor of the Scientific American:

In your paper of June 26, 1880, there is an attempt to answer this question.

By a comparison with that of the voltaic arc, W. E. Sawyer finds the temperature of the sun to be "not less than 12,000°, nor more than 50,000° Fah.," and then in "another way," evidently peculiar to himself, he obtains a similar result. That *other way*, Mr. Editor, is unique! Look at it a little. Assuming the mean distance of the sun to be 95,000,000 miles, Mr. Sawyer proceeds to obtain the diameter of the earth's orbit by doubling its mean radius and adding 800,000. Why add the diameter of the sun? He evidently is not aware that the linear distances of heavenly bodies are calculated from center to center.

Again, imagining the diameter of the earth's orbit to be that of a hollow sphere concentric with the sun, he states that the surface of that sphere would be "237·5 times the surface of the sun," because, forsooth, "the diameter of the sun is contained in the diameter of the earth's orbit 237·5 times." Mathematics teaches that *similar surfaces vary as the squares of their homologous lines;* that is, the surface of the hollow sphere will be to that of the sun as the square of 237·5 is to the square of 1, as 56,406·25:1. Now the heat from 1 square foot of the sun's surface will be spread over 56,406·25 square feet of our assumed sphere, and its intensity on 1 square foot must be less than $\frac{1}{56406}$ of what it is at the sun. If, then, we take the assumed mean of 100° at the earth, the temperature of the sun must be 5,640,625°, which corresponds more with the figures of "those who have estimated into the millions" than with what W. E. Sawyer has observed in electric temperatures. T. ROBINSON.

Washington, D. C., June 21, 1880.

The Melbourne Exhibition.

All the space assigned to the United States at the approaching International Exhibition at Melbourne, Australia, has been taken, and a very creditable exhibition is promised. Our exhibits will occupy 48,500 square feet in the Main Hall, 14,500 square feet in Machinery Hall, and a small space near the main entrance. Commissioner Pickering sails from San Francisco about the middle of July. He reports that the exhibition of agricultural implements will be the best ever made. The United States is expected to make an especially good display in the following sections:

Silver-plated ware, watches and clocks, cotton goods, firearms, tobacco, glassware, musical instruments, particularly in organs, axes and edge tools, locks and household hardware, carriage material, printing presses and type foundry material, sewing machines, scales and weighing machines, carpenters' tools, dental manufactures, chilled iron car wheels, lamps, stamped tinware, and seamless metal goods, billiard tables, safes, steam pumps, saws, and portable farm engines.

The exhibits of Connecticut will be shown collectively. There will be between 400 and 500 American exhibitors, including a large number of our most prominent firms.

Gen. John A. Sutter.

The marvelous rate at which history is made nowadays is forcibly brought to mind by the death of General Sutter, in whose mill-race gold was first found in California, only thirty-two years ago. General Sutter (originally *Suter*) was born at Kandern, Baden, February 15, 1803. He was educated in Switzerland, and emigrated to this country in 1834. After many adventures in the Far West and along the Pacific coast, engaged in the fur trade, he settled on a grant of land which included the present site of Sacramento, Cal., calling his fort New Helvetia.

The Mexican authorities appointed him governor of the northern frontier country; and, subsequently, under the American authorities, he was justice of the peace and Indian agent. He acquired great influence and wealth, but was ruined in 1848, when gold was discovered on his property, near Coloma, El Dorado Co., in February. His laborers deserted him, and his lands were overrun by the gold diggers. During recent years he has received an annual allowance of $3,000 from the State of California. In 1873 he removed to Litz, Lancaster county, Penn. He died at Washington, June 18.

The Pittsburg Exposition and Fair.

The Fourth Exhibition of the Pittsburg Exposition Society will be held next fall in the city of Allegheny, Pa., beginning September 2 and continuing until October 9. The success of the previous exhibitions has led the board of managers to add a fair to the Exhibition of this year, and to offer liberal premiums for live stock, farm and garden products. In furtherance of the latter project the area of the Exhibition grounds has been increased to twenty-five acres, and ample space has been allotted for the stabling and care of stock. The old buildings have been renovated, and a new and capacious machinery hall has been constructed, besides a boiler house and a large annex to the floral hall. New and powerful engines have been supplied, and every effort will be made to make the Exhibition profitable to exhibitors and enjoyable to the public. The allotment of space will begin July 26. Space is free; the entrance fee—Exhibition department, $5; Fair department, $2.

The Cincinnati Industrial Exposition.

The Eighth Industrial Exposition under the auspices of the Cincinnati Chamber of Commerce, Board of Trade, and Ohio Mechanics Institute will begin September 8 and close October 9. It will be open for the reception of Exhibits from August 18. From most exhibitors an entrance fee of two dollars is charged, but there is no charge for space or for motive power. Liberal preparations have been made for the exhibition of machinery in operation, and for the display of natural and industrial products, manufactures, and works of art. The exhibition last year represented twenty-four States, and was attended by 422,957 visitors. The coming exhibition promises to surpass in interest and value those which have preceded it. Over a thousand cash premiums and medals of gold, silver, and bronze are offered for competition.

The Cost of Keeping Soldiers.

The Paris *Constitutionnel* has been calculating the average cost of soldiers in the various European countries. It appears that the annual cost of each soldier in the English army is $700. The soldiers of Austria-Hungary cost $255 each a year. Those of France and Germany $215 each. The Italian soldier costs a trifle less than $200, and the Russian little over $190. The maintenance of the army costs annually to each head of the population, 6s. 6d. in Italy; 7s. 4d. in Russia; 8s. 6d. in Germany; 12s. 4d. in France, and 12s. 6d. in Great Britain.

Winking Photographs.

Winking photographs are said to be produced in the following manner: One negative is taken with the sitter's eyes open; another without change of position, with the eyes shut. The two negatives are printed on opposite sides of the paper, "registering" exactly. Held before a flickering lamp, or other variable source of light, the combined photographs show rapid alternations of closed and open eyes, the effect being that of rapid winking.

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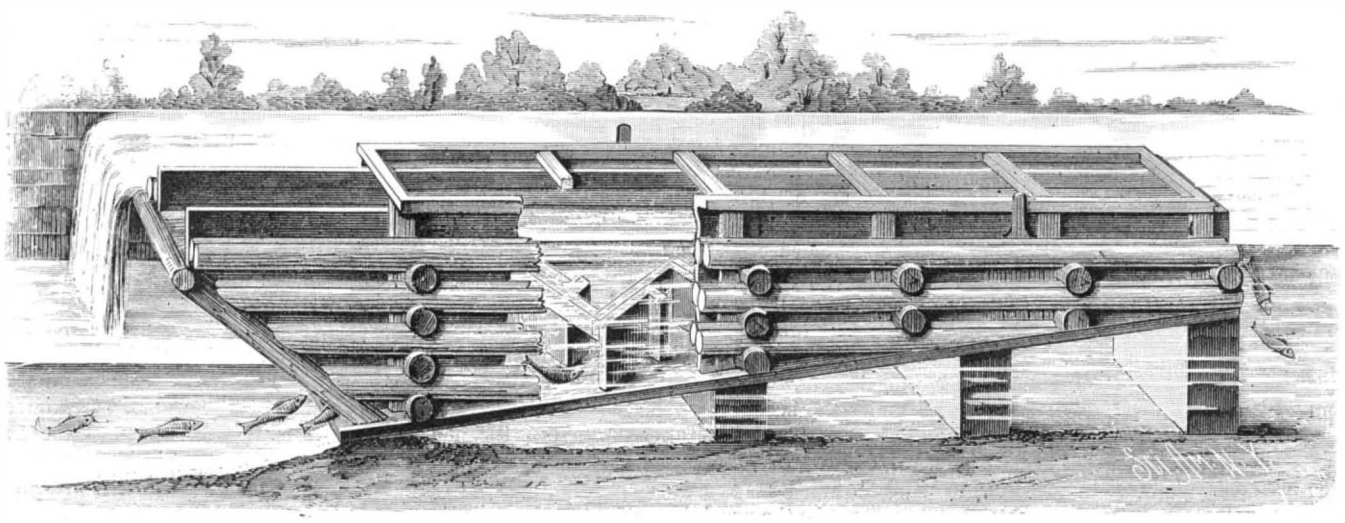
IMPROVED FISHWAY.

The engraving shows an improvement in fishways lately patented by Mr. W. H. Rogers, of Amherst, Nova Scotia. It is built in with the dam or rests against it, and affords to the fish a ready means of ascending the stream without regard to the number or height of the dams. The fishway has an inclined flat bottom and vertical sides forming a channel or trunk. The bottom has a rise of about one foot in eight or ten, and the sides extend above high water. The lower portion of the channel is divided into a zig-zag passage way by diagonal partitions, which are attached in alternation to opposite sides of the fishway. These partitions retard the flow of water and afford an easy passage for fish. To the upper side of the upper edge of each partition a flange is attached for the purpose of checking the water so as to form pools of comparatively dead water in which the fish may rest on their course up the fish way.

The lower entrance to the fishway is formed in the lower part of the dam. The fish readily find this entrance, as the water flowing from it is comparatively sluggish.

The fishway is held together by a strong wooden framing, and in the sides there are openings provided with slides which may be opened whenever the water gets too low to flow over the upper end of the way.

This simple device admits of utilizing streams for power without interfering with the fish and without wasting an undue quantity of water.



ROGERS' FISHWAY.

California's Grain Product.

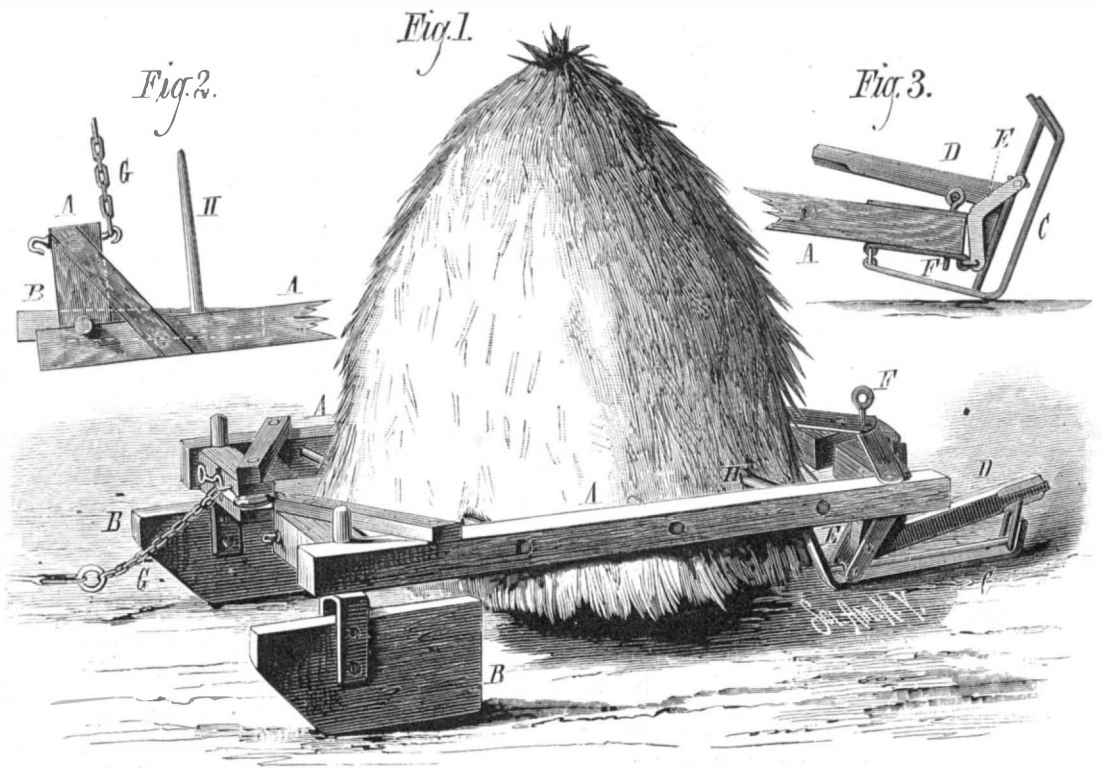
During the fiscal year just ended California has shipped about 580,000 tons of wheat (including flour) and 34,000 tons of other grain. As a larger area has been devoted to cereals this year, and good crops are now assured, the surplus for the coming year will doubtless be larger than last year's.

NOVEL CORN SLED.

The engraving represents a novel device for moving shocks of corn or other grain or fodder from one place to another without altering the form of the shock. The device is very simple, and can be easily and quickly operated. Two side frames, A, are supported in front upon pivoted runners, B, and at the rear on a folding runner, C, which may be operated by the lever, D, and link, E. The frames, A A, are jointed together at the rear upon the pin, F, and are drawn together in front by a chain, G, attached to one frame and running over a pulley in the other frame. Each side frame is provided with a number of fingers or pins, H, which alternate in position with the pins of the other frame.

To use the apparatus, the chain, G, being unhooked, the side frames are spread apart and drawn forward on opposite sides of the shock to be moved. The chain, G, is then fastened, and draught being applied to it the two side frames are drawn toward each other, forcing the pins, H, into the base of the shock. During the operation the runner, C, is in the position shown in Fig. 3, and now by pressing down the lever, D, the shock is raised from the ground and the runner is placed in the position shown in Fig. 1, when the sled with its load may be drawn forward. The operation of unloading the sled is simply the reverse of what has just been described.

This invention was recently patented by Mr. William H. Wood, of Elizabeth, Allegheny County, Pa., who may be addressed for further information.



WOOD'S CORN SLED.

A LARGE CANAL BOAT.—The largest canal boat that ever passed through the Erie Canal, arrived at this city June 16, with a cargo of 8,500 bushels of corn. The boat—the Henry J. Robinson—is 96 feet in length, 18 feet breadth of beam, draws 9½ feet of water, cost $5,500, and was built at Rochester, New York.

Government Fish Hatching.

At the hatching establishment of the U. S. Fish Commission at Washington about 20,000,000 shad have been hatched this year. Of these 15,000,000 have been turned into the Potomac River, and the remainder have been distributed mainly to the waters of California, Iowa, Kansas, Kentucky, the Carolinas, and Virginia. Yesterday 100,000 young shad two days old were shipped to Sandusky, Ohio, and the same number to Terre Haute, Ind., to stock the streams there.

During the year the Commission has distributed 25,000,000 fish. Carp have been sent to nearly every State in the Union, 3,000 applications for them having been received during the year.

The floating hatchery, Fish Hawk, soon starts on her first voyage to sea, to secure a supply of codfish eggs. Thus far the experiments in hatching cod have been encouragingly successful.

At the establishment of the Fish Commission at Druid Hill Park, Baltimore, salmon eggs are now being hatched. Arrangements have been made for regular shipments of the eggs of that fish from California. Good results are expected. It has been demonstrated that salmon will thrive as well here as in the waters of California.

Wonderful Sensitiveness of Photo Plates.

Photo plates made by the new photo gelatino-bromide process have such a remarkable sensitiveness that soft harmonious negatives may be secured in one-sixtieth of a second. The opportunities for instantaneous pictures are thus greatly extended. At a recent meeting of the Society of Arts, London, Mr. Gale exhibited photographs in which was shown the picture of a swallow poising in the air over a pond, the shadow and reflection in the water being very perfect.

A Seal Caught in New York.

A young female seal was caught asleep on Holmes' Reef, East River, June 18, by Captain J. H. Baxter, wreck master at Hell Gate. The little wanderer from the north was taken to the baths at the foot of East 86th street, where she has become a general favorite. She was from the first perfectly fearless and very gentle. She likes to be petted and never offers to bite. She is nearly three feet long, weighs about twenty pounds, and is thought to be about three months old.

Improved Steam Life Boats.

Another step ahead has been made in the equipment of our men-of-war, says the London *Times*, though to casual observers the present improvement may appear less important than it really is. The advance, however, is highly significant, as showing the progressive development of steam propulsion and the multiplicity of uses to which a single boat may be applied. At the present time the fleet is provided with steam lifeboats varying from 42 feet to 45 feet in length, and which possess the prime quality that they will not capsize or sink if filled by a sea, there being more than sufficient buoyancy in the air-tight compartments to sustain the engines, crew, and weights. The air compartments, again, being built into and forming part of the structure of the boats, give great longitudinal and transverse strength, thereby enabling them to be hoisted up in davits, and rendering them available at all times. But, inasmuch as the speed realized by the largest of these twin-screw lifeboats has never exceeded 9½ knots—a very fair rate in the circumstances—they have been necessarily confined to the performance of what may be termed the domestic work of the ship. The Admiralty, however, being desirous of extending the usefulness of these small craft, commissioned Mr. John Samuel White, of East Cowes, to build six sea-going life pinnaces of slightly larger dimensions, and which should realize a higher rate of speed than had yet been obtained from similar boats. The recent trials of these pinnaces at Portsmouth have been followed with great interest, and the results are in many respects remarkable. The boats measure 48 feet in length (or 3 feet more than the largest at present in use), 9 feet 3 inches in breadth, and 4 feet 9 inches in depth; and have a draught, when all their machinery and gear are on board, of 2 feet 8 inches forward and 3 feet 5 inches aft. They are built wholly of wood, and upon the diagonal principle, and are driven by compound engines, of which the high pressure cylinders are 7¼ inches, and the low pressure cylinders 11½ inches in diameter, having a stroke of 8 inches. The screws, which are four-bladed, have a diameter of 3 feet 2½ inches, a mean pitch of 4 feet 7½ inches, and a length of 5¼ inches. The boiler is fitted with a closed stoke-hole, the furnace being supplied with air by means of fans exactly after the manner of a torpedo boat. The total weight of the fully-equipped pinnaces is 152 cwt., that is, 86 cwt. the machinery with steam up, and 66 cwt. the hull. When tried on the measured mile by the Dockyard authorities the engines developed 120 horses, with 340 revolutions per minute, and realized a mean speed of just over 13 knots, which is almost equal to the speed of the second class torpedo boats which, as a matter of course, can only be used for torpedo purposes. The steam pressure was at 120 lb., and the engines were worked expansively with the cut-off at 9-16ths of the stroke. The increase from 9½ to 13 knots at a bound has given great satisfaction, and, as the consumption of fuel has been reduced from 6 lb. to 3 lb. per unit of indicated horse power per hour, the additional speed has been obtained without any additional cost of coal, seeing that the power developed in the 45 foot pinnaces was about 50. The question now arises whether these quick, light, and handy craft, which have had their fleetness greatly increased without injury to their special qualities as sea-going life pinnaces, could not be applied to purposes quite distinct from the ordinary work connected with a man-of-war, and thus help in freeing the decks and davits of an armor-clad from much of her present *impedimenta*. With a speed of 13 knots they will probably be found serviceable as patrol boats and for assisting in defeating a torpedo attack. Whether they may be adapted for offensive torpedo purposes, and thus compete with the steel boats, is a matter for consideration, but it is unquestionable that, while they possess the

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speed of a 60 foot torpedo craft in a straight line, their twin screws give them important advantages in respect of turning and going astern. With the rudder alone and with both engines going full speed ahead they can turn in from eight to ten times their length; but with one engine going ahead and the other astern they can go round in a distance equal to twice their length.

SEA OTTER, OR KALAN.

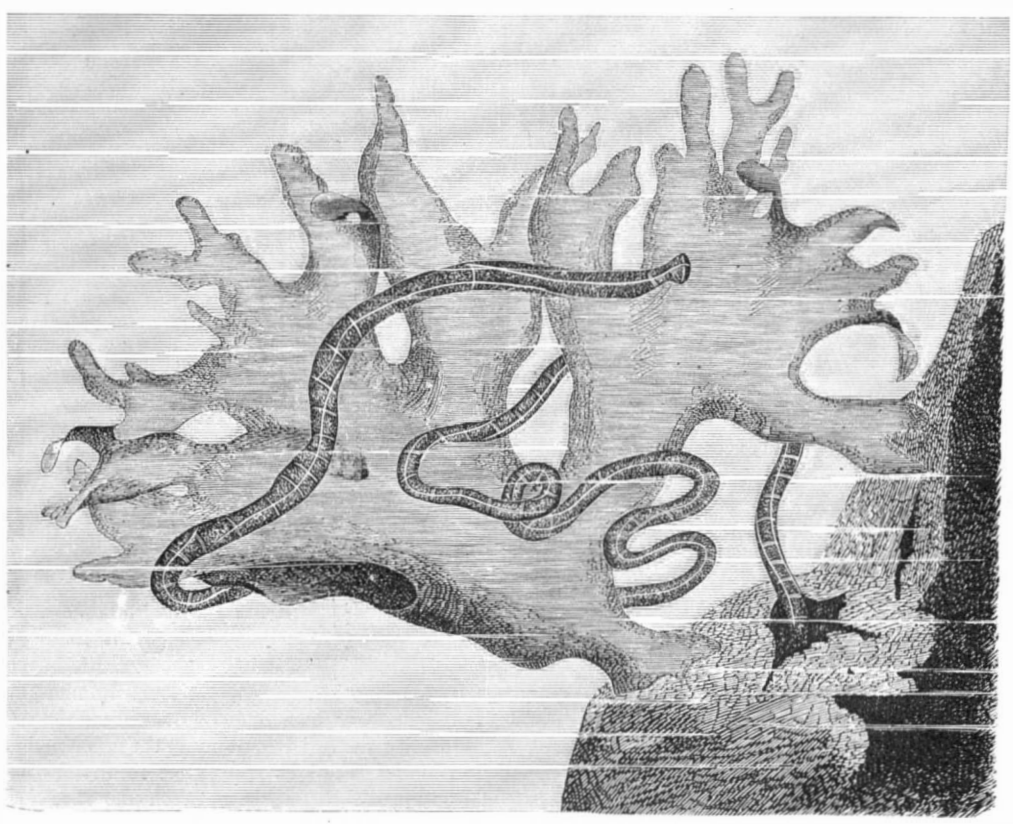
The kalan, or sea otter, says "Wood's Natural History," is very much larger than its fresh water relations, being rather more than twice the size of the common otter, and weighing as much as seventy or eighty pounds. During the colder months of the year, the kalan dwells by the sea shores, and can be found upon the icy coasts of the Northern Pacific, where it is extremely active in the capture of marine fish. When the warmer months begin to loosen the icy bonds of winter, the sea otter leaves the coasts, and in company with its mate proceeds up the rivers until it reaches the fresh water lakes of the interior. There it remains until the lessening warmth gives warning for it to make its retreat seawards, before the fierce frosts of those northern regions seal up the lakes and deprive it of its means of subsistence.

It is rather a scarce animal, and is not so prolific as many of its relations. The fur of the kalan is extremely beautiful, shining with a glossy velvet-like sheen, and very warm in character. It is in consequence valued at a very high price. The color of the fur is rather variable, but its general hue is a rich black, slightly tinged with brown on the upper portions of the body, while the under portions of the body and the limbs are of a lighter hue. In some specimens the head is nearly white, and in one or two instances the white tinge extends as far as the neck. Indeed, the proportions of dark and white fur differ in almost every individual. All the otters are long of body and short of limb, but in the kalan this peculiarity is more apparent than in the ordinary otters, on account of the curious setting on of the hinder limbs and the comparative shortness of the tail, which is barely more than seven inches long, while the head and body measure three feet in length. The food of the sea otter is not restricted to fish, but is composed of various animal productions, such as crustacea and mollusks. Some writers assert that, in default of its more legitimate food, it varies its diet by sea weeds and other vegetable substances.

SEA OTTER, OR KALAN.—(*Enhydra Lutris*)

NEMERTES, OR STRIPED POLIA.

The nemertes is somewhat like the leech, but it is not furnished with a sucker. It sometimes attains the extraordinary length of thirty to forty feet, and can extend or contract itself in a surprising manner. A specimen of twenty feet long is capable of suddenly contracting itself to the length of four or five feet. The exact length to which the nemertes can extend itself is not known. It is always writhing and coiling its long body into apparently inextricable knots, but never suffering any real entanglement. It will convert its body into a long and slender screw, and it is assumed that it moves from one place to another when coiled in this way. No accurate and reliable observations of the habits of this animal have yet been made.



NEMERTES OR STRIPED POLIA.

Effects of Severe Cold on Insects.

A very general impression prevails that severe winters are prejudicial to insect life. It is, however, a quite erroneous impression, for nothing has struck us so forcibly in our experience with injurious insects, as the fact that in most cases they pass more safely through a steady, even if severe winter, than through a mild or changeable one. We have repeatedly called attention to this fact in our own writings, and Miss E. A. Ormerod, in her "Notes of Observations on Injurious Insects," for 1879, has some quite pointed remarks on this subject, in connection with the severity of the past winter in England.

Severe and steady cold is not only favorable to insect hibernation, by causing a continued state of torpor, but indirectly in preserving them from the attacks of birds and other animals, which, during such severe weather, cannot reach them in the frost-bound ground.

Mild winters, on the contrary, generally cause premature activity in insects, often followed by relapses into the torpid state, and such changes are prejudicial to their well being. Insectivorous animals also fare better during such mild winters.—*American Entomologist.*

The Centrifugal Creamery.

The estimation of the quantity of cream contained in milk can now be made very accurately and rapidly, by means of centrifugal force. Attach the handle of a can, filled with milk, to a cord; hold the other extremity of the latter in the hand, and twirl as if for a sling; the cream, lighter than the rest of the milk, will accumulate on the surface free from all liquid, and more quickly than if in a state of repose; the time will even be lessened in proportion as the revolutions are rapid. When the milk has a temperature of 59° to 60° Fah., the separation of the cream takes place in fifteen minutes, at the rate of six hundred revolutions per minute. At the same time the quantity of water added to the milk for adulterating purposes can be ascertained. M. Gembloux having tested that pure milk contains ten per cent of cream, added one, then a second tenth of water, and when whisked the cream represented but nine and eight per cent of the volume of milk. Further, when whirled in the cylindrical churn, the contents formed three distinct layers—cream, water, and skim milk. The same centrifugal test was applied to butter, maintained in the liquid state by means of hot water; the water separated into three states toward the circumference of the churn—fatty butter, caseine, and salt water; it was in the latter all the mineral adulterations lodged. It was at the Exhibition of Vienna that an apparatus for separating cream from milk by centrifugal action was first made known. It is to M. Lefeldt that the honor reverts for applying the system on a vast scale by means of a turbine cylinder making eight hundred rotations per minute, when the cream is formed round the axle of the machine, after which comes the skim milk, and then the impurities, forming, as it were, three rings or zones. Other skim milk is introduced, which forces up the cream to run over, and thus out of the cylinder. Mr. Lawal's Swedish skimmer is so constructed that, in proportion as the cream and skim milk are separated, they pass off by the entrance of fresh milk. In the co-operative dairy at Kiel, 4,000 quarts of milk, the produce of 550 cows, are centrifugally skimmed per day.

NATURAL HISTORY NOTES.

Effect of Thick Sowing on the Sex of Dicecious Plants.—At the meeting of German naturalists and physicians at Baden-Baden last September, Prof. Hoffmann, of Giessen, as reported in the Berlin *Monatsschrift*, sought to show that seeds of unisexual plants, when thickly sown, result in a preponderance of males. Thus he found that one hundred seeds of spinach, sown in a six-inch pot, yielded two males to every female, whereas the same sample of seed produced an equal number of males and females in the open ground where they had plenty of room. This observation would be important if of general application, and especially with hemp, but Haberland disputes it so far as this plant is concerned. According to Hoffmann, sex does not reside in the seed, but depends on the conditions of germination. Unripe seeds of *Lychnis vespertina*, he found, gave a larger proportion of males than fully ripe seed. Seed of *Mercurialis annua*, artificially impregnated in early summer, gave more males than autumn impregnated seed. Prof. Prantl, of Aschaffenburg, remarked that crowded prothallia of ferns produce a larger percentage of antheridia, and scattered ones more archegonia. Prof. Pfeffer, of Tübingen, stated that he had observed a similar phenomena in the case of equisetum.

Interdependence of Animals and Plants.—The *Gardeners' Chronicle* gives an engraving of a very remarkable pitcher plant, new to cultivation, but described by Dr. Hooker, a few years ago, from dried specimens collected in Borneo by Low and others. The large bag-shaped pitchers are, when fully developed, provided with two sharply toothed wings. The neck of the pitcher is thrown into ridges with intervening furrows, and is prolonged at the back into an erect, or slightly incurved process, terminating in two sharp recurved spurs, the whole reminding one of the head of a snake uplifted and ready to strike with its fangs. At a recent meeting of the Linnæan Society Mr. Burbridge, an observant naturalist, read a paper on the subject, which throws some light on the curious organization in question, and is of considerable interest as illustrating the solidarity of the organic world. It seems that the stalk of the lower bag or ampulla-shaped pitcher is swollen and hollow, and in their native country most of them are perforated by a species of black ant, which forms its colonies in the old and dry pitcher, and continually visits the fresh ones, so far as can be determined, for the purpose of obtaining food and water, since these fresh pitchers contain a miscellaneous collection of dead and decaying insects of many kinds. As these pitchers are perfect traps to creeping insects of ant-like character by reason of the incurved ridges round the throat of the pitcher, these black ants ingeniously perforate the stalk, and so obtain their supplies, and provide a means of exit in case of need. Now as to the uses of the formidable spurs which lie concealed under the kidney-shaped lid of the pitchers: There is found in the Bornean forests, where this fine pitcher plant grows, a curious little animal called by the natives "Tamperlilie," and by the few Europeans who have ever seen it alive, the "Spectre Tarsier" (*Tarsier spectrum*). It is a most singular and interesting creature, about the size of a rat. An engraving of it is given on page 247 of the SCIENTIFIC AMERICAN for October 18, 1879. Its head is singularly like that of a small kitten; the eyes are large and full, the body is monkey-like, and the tail slender and as long as the body, but bushy at the tip like that of the lion. Its feet have curiously enlarged disk-like tips, reminding one of the enlarged ends of the climbing tendrils of the Virnia creeper. This little animal is an insect-eater, and knowing that the pitchers contain entrapped insects, visits them pretty regularly. In the case of some of the pitcher plants the insects imprisoned in their unarmed urns are readily removed, but not so in the species under consideration, as the sharp spurs are so placed that the tarsier is sure to be pricked by them, and quite sharply too, if its head is inserted under the lid for getting at the interior. The main question, and the one yet to be solved, is, of what use are the living ants, and what end is this one species of *Nepenthes* made to serve as the nest of a peculiar species of these insects. To suit its requirements not only is its very structure modified, but especial precautions are taken to ward off the insect-eating tarsier. The use of the entrapped insects we already know, for it has

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been demonstrated by Dr. Hooker that the pitchers of *Nepenthes* not only allure insects by a sweet secretion at the rim and upon the lid of the cup, but also that their capture, or the presence of other partly soluble animal matter, produces an increase and an acidulation of the contained watery liquid, which thereupon becomes capable of acting like gastric juice in dissolving flesh, albumen, and the like. In other words these pitchers seem to be stomachs. Borneo is indeed a land of many wonders. Dr. Beccari has found there a curious plant (*Myrmecodia*) which never fully develops until bitten by a large red ant. They make their nest in the swollen stem, and thence rush out to repel all invaders. Dr. Beccari asserts that the presence of these ants is absolutely essential to the plant's existence, for unless the young plants are thus attacked they soon perish.

IMPROVED ELEVATOR.

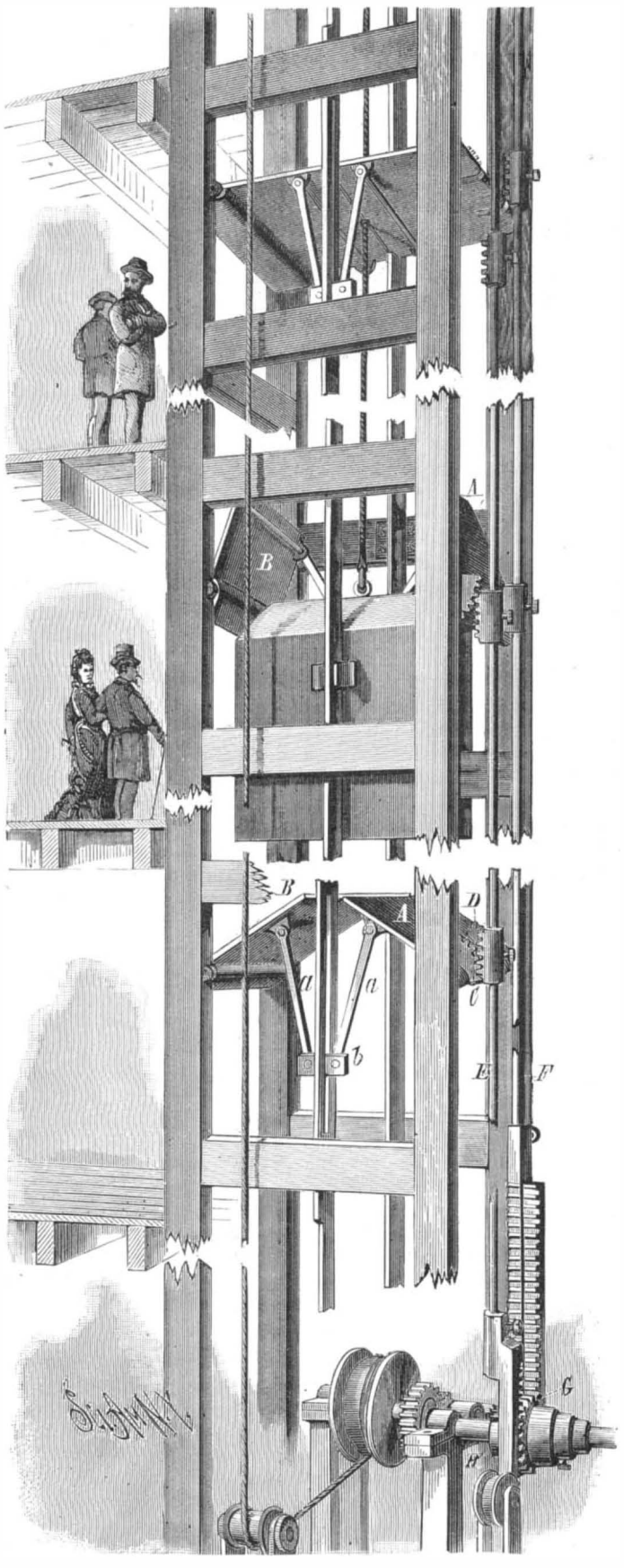
The frequency of accidents to elevators has suggested a practical field for invention, to which some of our inventors have turned their attention. By some safety is sought in pawls and ratchets, in a multiplicity of ropes, and in the hoisting machinery itself; but the inventor of the device which we illustrate secures safety by automatically opening and closing the hatches as the elevator approaches and recedes from them. This plan not only secures the elevator car from dangerous falls, but it also prevents persons from falling down the hatchway, and in case of fire prevents its spread through the hatchway.

The mechanism by which this very desirable end is accomplished is both novel and ingenious. The hatchway is closed at each floor by two doors, A B, which are connected by links, *a*, with a slide, *b*, moving in guides at the side of the hatchway, so that when one door is moved in one direction the other will be correspondingly moved in the opposite direction. The doors, A B, are each provided with two segmental racks, C D, which are engaged alternately by racks on the vertical rods, E F. These rods extend from the top to the bottom of the hatchway, and are provided with as many short sections of rack as there are segmental racks attached to the doors.

On the driving shaft of the elevator there is a loose spur wheel, G, engaging a rack on the lower end of each of the rods, E F, so that when one of the rods moves upward the other moves downward. Upon the rod, F, in addition to the rack already mentioned, there is another rack which is engaged by a wheel having cogs in a segment of its periphery, H, secured to the driving shaft. The car is hoisted in the usual way, and as the driving shaft revolves an intermittent vertical movement is imparted to the rack on the lower end of the rod, F, by engagement with the mutilated wheel, H. The rod, E, by virtue of its connection with the rod, F, through the spur wheel, G, is also moved vertically, but in the opposite direction.

When the car is ascending the rod, F, with its racks, is moved downward, and its movements are timed relatively with the movement of the car, so that just before the car reaches a pair of doors the rack segment, D, on the door is engaged by one of the racks on the descending rod, F, and the doors are opened, at the same time one of the racks on the rod, E, engages one of the rack segments, C, on the door below, closing the doors immediately after the passage of the elevator through the floor to which the doors belong. When the car descends the reverse of what has just been described occurs.

This invention was recently patented by Mr. James W. Evans, care Geo. F. Betts, Equitable Building, 120 Broadway, New York city, who may be addressed for further information.



EVANS' IMPROVEMENT IN ELEVATORS.

A Great Towing Feat.

One of the longest towing feats on record was lately accomplished by the salvage steamer Recovery, of Liverpool, in towing from St. Vincent, W. I., to Flushing, Holland, the Italian screw steamer Centro-America, which had broken her propeller shaft. The Recovery left St. Vincent, with the steamer in tow, April 1, and arrived at Santa Cruz, Teneriffe, April 11, where she was detained one day. The Lizard Signal station was passed April 24, the run from Teneriffe, 1,383 miles, having been made at an average of 115 miles a day. Flushing was reached on the 27th, making the whole passage of 2,578 miles in 26 days, deducting the detention at Teneriffe. Two heavy gales were encountered by the way. The best day's work was 144 miles. The Centro-America registered 1,384 tons.

Preservation of Hops.

The principal feature in this new system consists in sprinkling the hops with alcohol prior to packing, and then pressing them tightly into air-tight vessels. In course of time the alcohol combines with some of the constituents of the hop, and certain volatile ethers are thus formed; these possess a strong and peculiar fruity smell, but being very volatile, they are all dissipated during the boiling. Dr. Lintner has experimented on these preserved hops at Weihenstephan, and speaks well of them; he says the fine color is retained and there is a full development of aroma; the fermentation of worts made with these hops worked well, and the resulting beer possessed a fine bitter flavor. If this method of sprinkling with alcohol will stop the development of valerianic acid, which takes place in hops when stored in the usual manner, it ought to come into general use.

Wind Pressure.

Does the wind, in passing through the open spaces left between the solid members of an articulated structure (such as a bridge), experience no further resistance than that offered by the net area of the solid surfaces of the members? We think it does. Air is a fluid equally with water, and it is well known that when water issues through an orifice in a flat surface, the issuing stream is very sensibly contracted to much less than the area of the orifice. This coefficient of discharge through holes in plates or flat surfaces is as low as 0·62. Or, in other words, only 62 per cent of the opening is truly effective for the passage of the liquid. Without doubt, these principles apply equally to all fluids, gases as well as liquids. In the case, then, of air flowing through an articulated structure, we do not think that the full area of the openings, between the solid members, should be considered as effective for the passage of the air, but only to a reduced extent of, perhaps, from 60 per cent to 70 per cent. This would have the effect of adding very largely to the gross resistance offered by any articulated structure to the wind—in fact, it would cause an addition of from 30 per cent to 40 per cent of the openings to be added to the solid members as representing the whole area offering a resistance to the passage of the wind. This additional amount of resistance may be found more than sufficient to occasion overturn, when otherwise it would be far from being anticipated by calculation.—*Iron.*

A Curious Phenomenon.

The *Plaindealer*, of East Kent, Ontario, states that a curious and inexplicable phenomenon was witnessed recently by Mr. David Muckle and Mr. W. R. McKay, two citizens of that town. The gentlemen were in a field on a farm of the former, when they heard a sudden loud report, like that of a cannon. They turned just in time to see a cloud of stones flying upward from a spot in the field. Surprised beyond measure they examined the spot, which was circular and about 16 feet across, but there was no sign of an eruption nor anything to indicate the fall of a heavy body there. The ground was simply swept clean. They are quite certain that it was not caused by a meteorite, an eruption of the earth, or a whirlwind.

The New Brooklyn Elevator.

A brick elevator, with stores, rivaling in capacity the great elevators of the Erie and the Pennsylvania Railroad Companies in Jersey City, has just been erected in Brooklyn by David Dows & Co., of this city. It is intended exclusively for handling and storing grain for the European trade.

The façade on Columbia street is 200 feet, and the sides reached to the Atlantic dock stores, of which it will form a part, are 175 feet on each side and three stories in height. The chimney is situated on Pacific street, about the middle of the building, and is 12 feet square at the base, rising to the height of 180 feet, which is also the height of the elevator. The upper part of the latter will be entirely of framework, extending the full width of the store on which it rests, and will contain five tiers of chutes leading to the wharves on either side, so as to be readily connected with the holds of vessels. A novel feature in connection with these chutes is that they form a continuous circuit with other chutes leading from the new building.

But the essential feature of the structure in which it differs from the other elevators in use is the erection of two elevators on the Columbia street side, corresponding in height and shape to the elevator proper at the wharves. These will be so connected with each other and with the main elevator, that any or all can be used simultaneously in loading from one to four vessels, or in unloading grain from canal boats or lighters at one point, and at the same time loading steamers at another. It is in the facility with which this process can be carried out that the great improvement in the elevator system consists. So great is the capacity of the stores that 20,000 tons of grain can be readily stored on any floor of either building. The machinery will be so adjusted that a double hoisting system can be employed with as little difficulty as the single hoisting system now employed on the railroad elevators. It is calculated that by this method two transatlantic steamers of the greatest capacity can be loaded with grain within eight hours by the simultaneous operation of the double hoisting apparatus.

Explosions of Malt Dust.

One of the Burton-on-Trent breweries has narrowly escaped destruction by fire. A violent explosion occurred in the malt grinding room, and as soon as the workman in charge, who had been thrown on to the ground, could recover himself, he found that the hopper above was in flames, which, fortunately, were soon suppressed. There is but little doubt that this explosion was caused by a sudden combustion of malt dust, and it is well that brewers should be warned against this danger. Finely divided combustible powders, such as flour, malt dust, coal dust, etc., will explode, and there are on record many serious conflagrations which have been traced to this cause; in America several large flour mills have been totally destroyed by fires originating in this way. Some difference of opinion exists as to the way in which these explosions are brought about; it is, however, easy to imagine that a combustible substance like malt, flour, or coal, may be reduced to such a fine state of division as almost to approach the gaseous state, and being thus intimately mixed with the oxygen of the atmosphere, we have all the materials for a sudden and explosive chemical combination. Some persons have argued that these explosions are spontaneous, but we incline to the opinion that either a flame or a spark is required to bring about the combination. It is a common practice in some breweries to place an unprotected gas jet or lamp close to the malt mill, and in this way the inflammable dust may easily become ignited; or the same result may be produced by a small stone passing between the steel malt rolls, by which a spark is produced, and thus the dust is exploded. Precautions against these two sources of danger should be observed in every brewery. —*Brewers' Guardian.*

A BEEFSTEAK chopped up fine and baked with flour and yeast in the form of a "meat-bread" loaf is the latest dietetic sensation. It is asserted that meat thus treated entirely disappears during the process of purification, the nutritive principles becoming incorporated with the bread. M. Scheurer Kestner has just been explaining the process.

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THE STRUCTURE OF MATTER.

Read before the New York Academy of Sciences by Prof. C. F. Kroeh, of the Stevens Institute of Technology.

It is a well recognized fact that much of the progress in chemical and physical science is due to the increased attention given by investigators to the molecular structure of matter. The labors of Clausius in founding the mechanical theory of heat, of Tait, Sir William Thomson, and others in studying the motions of gases, the researches of Helmholtz in hydro-dynamics, of Clerk-Maxwell in electro-dynamics, of Julius Thomsen in thermo-chemistry, and of Crookes on residual gases, may all be attributed to this cause; while Graebe and Liebermann have shown by their discovery of a method for preparing artificial alizarine, that "mere theory," as the practical man of the past was wont to call it, may become of great industrial utility.

Seeing, then, the obvious importance of the results already reached, and believing that we are only upon the threshold of higher achievements in the same direction, it occurred to the writer that the interests of science might be promoted by bringing together precise information concerning the views held at present by the most prominent workers in this field, and the evidence upon which these views rest.

In a series of articles published in the SCIENTIFIC AMERICAN of May 17, June 7, June 14, July 19, and August 23, 1879, the arguments, from which the following results are derived, were presented:

1. That the elements and compounds combine in invariable simple or multiple proportions by weight.

2. That this fact is explicable by the assumption of ultimate particles having different weights.

3. That gaseous bodies combine in invariable proportions by volume.

4. That this fact, together with the behavior of gases under variations of temperature and pressure, enables us to ascertain the relative weights and volumes of the ultimate particles of gaseous bodies.

5. That the ultimate particles, whose relative weights are thus found, and which we may now call molecules, must themselves consist of still smaller particles or atoms, about which we have no definite information, except that the number of them contained in the molecule of one substance bears a simple numerical ratio to the number of them contained in the molecule of another substance.

6. That, until the absolute size of molecules is known, a molecular volume can be regarded only as the cubical space of which, at a given moment, the molecule forms the center.

7. That, starting with this conception, ingenious attempts have been made to determine the relative molecular volumes of elements in their compounds, and that different investigators have reached different results. To this I might add,

8. That finally considerable insight has been gained by this means into the properties of compounds.

These papers were preceded by a statement of a few facts warranting the assumption that matter is composed of exceedingly minute particles. It will be necessary in the following papers to give further evidence, after showing what opinions the master minds of the past held concerning the structure of matter. Impressed as I am with the consciousness that we are but too liable to be biased by prevailing hypotheses, and to accept them as demonstrated truth, simply because the erosive action of habitual use has worn channels in our minds from which our thoughts cannot escape without a great effort, it has seemed to me an imperative duty of scientific men to return, from time to time, to first principles, and to review the opinions of the past by the aid of the new light of modern thought.

THE EXISTENCE OF MATTER.

It seems to be a prevalent belief that no one but a metaphysician would take it into his head to doubt the existence of matter and the reality of the universe outside of ourselves. However, it was but a few years ago that a friend, standing on one of the balconies of Horticultural Hall at the Philadelphia Exhibition, and lost in admiration of the region of wonders before him, was accosted by a stranger who persisted in trying to prove that it was all unreal.

It was recognized early in the history of philosophy that the perceptions of our waking hours do not differ much from those of our dreams, and the question naturally arose: How do we know that life is not a continual dream? This and all similar questions have been long ago disposed of, however, by the recognition of the fact that our reason sits in judgment upon our perceptions and decides upon their validity. In other words, we know when we have been dreaming. Yet the fact remains that our senses do deceive us.

When we look at the starry heavens, science teaches us that there is no reality in what we see. Light, with its enormous velocity of 186,000 miles per second, takes 3½ years to reach us from α Centauri, 22 years from Sirius, and 50 years from the Pole Star. It is evident, therefore, that what we see simultaneously is not simultaneous in reality. We see at the same moment one star at the place where it was 3½ years ago, and another where it was 50 years ago. The sun himself has traveled onward for over eight minutes since the light started from the place where we see him at a given moment. Have we then ever really seen the sun?

If our senses so obviously deceive us in this as well as in many other experiences, what guarantee have we that they do not deceive us in all? Simply this, that we are not really deceived even in these experiences, but we have the power to make the necessary corrections. No argument in favor of the unreality of the material world based upon such considerations can prevail against the universal experience of mankind. When many persons receive the same impression under the same conditions, there must be something external to them to produce that impression. According to the calculus of probabilities, the chances that they would all, each of his own accord, think the same thoughts or dream the same dreams, are infinitesimal.

Let us now inquire into the views held by the thinkers of the past concerning the structure of matter.

ARISTOTLE.

The first conception of matter that merits our attention, though not the most ancient, is that of Aristotle (384 to 321 B.C.).

Our daily experience teaches us that the properties of bodies continually change. The tints of the sky, the sea, and the mountains vary from hour to hour; water is at one time a liquid, at another a solid, or a vapor; the air is now at rest, then it assumes a gentle motion, or rushes onward with a frightful velocity.

It is a natural inference that in all these phenomena there is something that changes, something that moves, and that none of the properties, motions, or changes we observe are essential to it. Thus we arrive at Aristotle's conception, that matter is something without any properties whatever, yet capable of assuming all properties; something without power of its own to move, yet capable of receiving motion. It possesses nothing but quantity, and that quantity must be unlimited.

Aristotle recognizes a first cause through whom this matter received motion and properties, but assumes that matter is coeternal with God, *i. e.*, that it existed *from* all eternity.

According to this system the first act of the Deity upon matter was its endowment with properties and motion. This is equivalent to a creation, since the objects we now see are its results, and it is perhaps difficult to conceive why Aristotle did not represent God as creating these objects out and out, matter and properties together. The explanation lies in his conception of the Deity, a conception arrived at as follows:

Passive matter must be moved either by a cause that is itself in motion, or by a cause that is at rest. Now, a cause that is itself in motion would need to have its own motion explained by a cause yet more remote, and so on indefinitely. We have left only a cause that is itself at rest. Such a cause can be only a mind, a spirit. Accordingly the god of Aristotle is pure thought, a perfect mind, that is the object of its own contemplation. Now, a mind could think properties, but it could not think concrete, material objects.

The difficulty with Aristotle's world of uncreated matter without properties is, that motion must be imparted to it by mere thought, and that in such a world there must be a constant intervention of the Deity, a continuous miracle.

LEUKIPPOS AND DEMOKRITOS.

We pass in the next place to a system that has more affinity with modern thought, the system of Leukippos and Demokritos, who maintained, about 400 B.C., in opposition to Anaxagoras, the teacher of Sokrates, that bodies are not infinitely divisible. We finally reach particles infinitely small and invisible, which are called atoms and are indivisible. By reason of their indivisibility they are indestructible and unchangeable, and they completely fill the space they occupy. All atoms are identical in substance and differ only in shape and size. Differences in substance are produced by different groupings of these atoms, which have only one physical property, weight.

All invisible bodies consist of atoms and empty spaces. Motion, it is argued, is a necessary result of this. The atoms have always been falling, like snowflakes, through empty space. The larger ones overtake the smaller and form still larger bodies. Thus accretion goes on, a whirling or vortex motion is produced, and worlds are formed. There is no evidence, according to these philosophers, that motion is the result of purpose or design.

Unfortunately for this system large bodies do not, as a matter of fact, fall faster in vacuo than smaller ones.

EPIKUROS.

Epikuros (342 to 271 B.C.) endeavored to rectify the errors in the system of Leukippos and Demokritos. He reasoned thus:

Matter consists of indivisible atoms differing from each other only in size, shape, and weight. A finite body could not have an infinite number of parts; therefore its divisibility cannot be infinite.

Atoms have a limited number of shapes and sizes; but of each kind there exists an infinite number.

Space and the number of atoms that exist in it must both be infinite. Finite space could not contain an infinite number of atoms, and on the other hand, a finite number of atoms would be lost in infinite space.

Now for motion. From all eternity atoms have been falling through space by reason of their weight. There being no resistance in a vacuum they must all have had the same velocity, and they could never have met and combined to form bodies and worlds, if their fall had always been vertical. So Epikuros invented a lateral deviation that he ascribed entirely to *accident*. Granting this, we may have collisions and repulsions, whirling motions and aggregations that spring into being and pass away again without law.

But we cannot grant this. We cannot at the same time pretend to search out the laws of nature, and admit the word accident into our scientific vocabulary. Accident is simply an unknown cause. When, therefore, Epikuros attributed the meeting of atoms to accident he practically confessed that he did not know what made them meet.

It is worthy of note that Epikuros gave as his motive for inventing his system a desire to destroy superstition, to remove the dread of the gods, and to restore tranquillity to the mind. This means, in plain English, to abolish the Deity and personal responsibility.

Curiously enough, these mischievous atoms, after having become the basis of modern science, were so modified and adapted in the course of time that they have furnished Sir John Herschel and Prof. Maxwell with a very powerful argument to show that they could not have been evolved, but must have been created.

DESCARTES.

In more modern times thinkers endeavored to find in matter some fundamental property that inhered in it, while all other properties were only accidental or derived. Descartes, the inventor of analytical geometry (1596 to 1650), was led by the universality of geometric truth to regard extension as the very essence of matter. According to his system there can be no material atoms. A particle, however small, must still have dimensions, and it must therefore be divisible. If there are no atoms, there is no further necessity for imagining empty spaces. Nothing existing in nature corresponds to the conception of a void. If a void existed, no motion could be communicated through it. Space is only a figment of the imagination, and motion is possible by contact only. The whole universe is everywhere equally full of matter. When a body moves it does so by displacing other matter. It crowds out what is before it, while at the same time the matter behind it fills its former place. It is thus that a fish swims. While Descartes denied the existence of atoms, which, by their own nature, are indivisible, he admits that the Deity may have made certain particles indivisible in the sense that no creature can divide them.

According to this conception the sum total of motion imparted to the world at the creation remains unchanged. The universe is a vast machine, which transmits motion from one part to another, but does not destroy it.

(To be continued.)

NEW INVENTIONS.

Mr. Levi H. Roberts, of Cadillac, Mich., has patented an improved fastening for tool handles. The object of this invention is to secure handles to tools in such a manner that they will be held in place firmly, and can be attached and detached easily and quickly. The invention consists in a fastening for tool handles formed of a key and a plate roughened upon one side and smooth upon the other. The plate and key are inserted between the rear edge of the handle and the rear edge of the tool eye.

An improved attachment for fire-places has been patented by Mr. Frank S. Elsberry, of Montgomery, Ala. The object of this invention is to so construct the back of a fire-place or fire-place grate, and to provide it with such attachments in the form of pipes and valves that it shall be adapted for receiving a supply of water and holding it while being converted into steam, which is distributed in pipes to different parts of the dwelling or other structure in which the grate is located.

An improved double-tree has been patented by Mr. John J. H. Parrott, of Salem, Oregon. The object of this invention is to provide a device to be applied to a vehicle whereby the hindmost horse shall be enabled to pull with more advantage than usual when endeavoring to draw abreast with the foremost horse. The invention consists of a straight rack fixed centrally on the front edge of a double-tree and gearing into a corresponding segment rack that is fixed on the tongue of the vehicle.

Mr. David James Rogers, of Bardstown, Ky., has patented an improved ice cream freezer of that form in which the can containing the cream is rotated upon a central pivot, and is provided with a vertical lifting beater or scraper, which removes the frozen cream from the sides of the can as it freezes.

An improved nose piece for bridles, patented by Mr. Rhodes Arnold, of Waltham, Mass., consists in the combination with the bit and the head piece of a bridle, of straps for counteracting the pressure of the bit on the mouth and lower jaw of the animal.

Mr. Francis M. Foster, of Coffeyville, Kan., has patented an improved sulky plow, which is so constructed that the plow shall be in front of the wheel, so that the plowman can see the plow and the team without changing his position.

Successful Treatment of Tetanus.

Dr. John C. Lucas, in the *Medical Times and Gazette*, strongly advocates the treatment of tetanus by smoking Indian hemp. The leaves of the cannabis indica are mixed with three or four times their quantity of ordinary tobacco. Directly there are indications of a spasm coming on, the fumes are inhaled until the attack ceases. The patient is then left quiet, but carefully watched, so that the pipe may be instantly handed to him on any appearance of the spasm returning. In this way the patient is kept continuously under the influence of hemp, day and night, nourishment being carefully administered at the same time. The advantages claimed for this mode of treatment are these: 1. The spasms are cut short. 2. They reappear gradually at longer and longer intervals. 3. They gradually become not only less frequent, but less severe. 4. This saves the patient's vital powers. Mr. Khasligir, of India, has also treated five cases of traumatic tetanus, all recovering by this method.

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The Convention of the American Medical Society.

The thirty-first annual convention of the American Medical Society, in this city, the first week in June, brought together a large number of distinguished physicians and surgeons. In his presidential address Dr. Sayre spoke of the indebtedness of the world to American physicians and surgeons, in the development of new methods and novel operations, commencing with anæsthesia, as associated with the name of Morton, and passing to ovariotomy, another American surgical discovery. This operation, said he, was first performed in 1809, in Danville, Ky., by Dr. Ephraim McDowell. Dr. Atlee, in 1844, revived the operation, and by persevering effort, in spite of all opposition and the very general condemnation of his contemporaries, was enabled at last, by his numerous brilliant successes, to establish the operation as a proper one in certain cases. Dr. Peaslee has stated that, in the United States and Great Britain alone, ovariotomy has, within the last thirty years, directly contributed more than 30,000 years of active life to woman.

In gynecology, the whole professional world gratefully acknowledges the original and invaluable contributions of Sims, Thomas, Emmet, Peaslee, Atlee, Kimball, Dunlap, Minor, Taylor, Pallen, and others. The new operation of litholapaxy, which consists in the fragmentation of calculous material, and the removal of the *débris* by aspiration through a tube, first performed and described by Dr. Bigelow, is also one of the grandest triumphs of modern surgery, and one of which any American surgeon may well feel justly proud. In conservative surgery, Americans certainly compare most favorably with Europeans. In the treatment of diseases of the joints, by which means the patients are able to take free exercise in the open air during the whole progress of the disease, thus acquiring power to overcome the constitutional dyscrasia better than by any means heretofore employed, and when the disease has progressed beyond repair, then to perform the sub-periosteal exsection of the joint in such a manner as to leave the muscular power intact, and by judicious after-treatment to restore the function of motion, America has obtained a triumph in surgery of which the profession may well be proud. Another triumph of American surgery is seen in the application of the principle of absolute rest to diseases of the vertebræ.

A large number of papers were read, and several important meetings were held by related societies, among them the second annual convention of the American Laryngological Association, the fourth annual meeting of the American Medical College Association, and the fifth annual session of the Association of American Medical Editors.

A Lesson to Young Men.

In the nomination of General James A. Garfield for President at the recent Chicago convention, a lesson is taught from which all young men may profit. It may not be possible for every youth, be he ever so industrious and studious, to obtain a nomination for President of the United States, but by untiring industry and a persistent determination to acquire an education, as illustrated in the life of General Garfield, summarized by one of our contemporaries, it is possible for every young man of ordinary intelligence, be his origin ever so humble, to elevate himself to an honorable position in life.

After eulogizing General Garfield's military and political career, which it is not our province to discuss, the *Public Ledger* proceeds to say of his early life:

And what he is he has made himself, so far as any man is the builder of his own character, distinction, and honors. Left an orphan when he was but two years old, his widowed mother, with four children, being the possessor of a small farm in the "backwoods" of Ohio, he began to work as soon as he was old enough to aid in the support of the family. At sixteen he was a carpenter's boy; then driver of a canal boat, and subsequently a boatman, though not a man in years. He then intended to become a sailor on the lakes, but being persuaded by a young village teacher, he went to Geauga Seminary, and this turned the whole current of his life. Here the sturdy character of the future man showed itself. He had no money, except a very small sum his mother had saved. He and some others took a room and boarded themselves in a very abstemious fashion, being their own cooks. In the mornings and late afternoons he turned his hand to carpentering, and so supported himself. Continuing at the seminary, and at one of the country institutes, he kept himself going in the same way, varying his carpentering resources with teaching school in the winter, until he was twenty-three, and on his way to college, where he went through a two year term, came out the best Latin and Greek scholar, and was soon made professor and president of another academical institution.

More Inflammable Silk.

A recent fire in a bonded warehouse in this city, by which $5,000,000 worth of goods were in danger, was traced to a lot of German black silk twist. Not long before a case of what was classed as silk goods was brought out of the hold of a Bremen steamship. The case had not been long on the wharf when it was discovered to be on fire. It was immediately thrown in the water, and, after the fire was extinguished, it was discovered that the case contained German black silk twist.

The ready combustibility of the silk in question is said to be due to a certain acid used in its preparation. Under very ordinary conditions oxidation takes place, and the silk becomes burning hot. When cooled it is found to be completely rotten. The large quantity stored in the endangered warehouse, it is thought, became overheated, the doors and windows being closed, and spontaneous combustion was the result.

Iron and Steel Making in Great Britain and America.

There are few British journals that are more thoroughly insular and anti-American in editorial ideas than the London *Engineer*. The following from its leading article is, therefore, quite refreshing:

Nothing connected with the crude iron trade possesses just now greater interest than the individual output of blast furnaces. For many years we were content in this country to blow with a comparatively small pressure, and to get from 180 to 220 tons of pig per week from each furnace. As time went on and competition increased, attempts were made to get more iron in a given time, and about fourteen years ago began the era in this country of large blast furnaces. In a very short time the dimensions increased from 14 foot to 16 foot boshes, and a height of 45 feet to 50 feet to 28 foot boshes and a height of as much as 80 feet. These enormous furnaces turned out a great deal of iron as a matter of course. It does not appear, however, they were eminently satisfactory either as to the quality of the product or the price at which it could be made. In the Lehigh Valley in the United States ore had for years been smelted with anthracite, the pressure of blast being 3½ pounds to as much as 6 pounds per square inch; the furnaces were small and the yields high. As the iron trade of America extended under the fostering influence of protection, a competition seems to have sprung up among iron manufacturers in the States. Each man tried to make more iron in a given time than his neighbor, and, as we have already recorded in our pages, a furnace of no great dimensions at the Edgar Thompson Steel Works has recently been making as much as 700 tons of excellent pig iron each week. Much of this success is due to the Cowper stoves which heat the blast. Something is due to the ore, but most is due to the skill and energy of the managers, who avail themselves of every chance, and rest not until they have satisfied themselves that no more can be got out of their furnaces. In this respect we are now far behind our American rivals, although it is not to be disputed that progress is being made. In 1860 the average annual make of iron per furnace in Great Britain was 6,574 tons. In 1866 it reached 7,384 tons; in 1871 it was 9,696 tons; it 1875 it was 10,119 tons, and in 1878 it attained 12,831 tons. Assuming fifty weeks to be a blast furnace year, there was for 1878 a weekly production of about 257 tons per week, or not one-half the duty of many American furnaces.

Next in importance to the production of iron is the production of steel. Here, again, we are beaten by the United States. In 1878 there were in America 27 converters, 20 of which were at work, and these turned out on the average 36,988 tons of steel per annum each. Last year there were at work in this country 68 converters out of 104, and the average annual production of these was but 12,272 tons each, or less than one-third of the yield of the American plant. Why this should be so is a question well worth discussion. We shall be under the mark if we say that Bessemer plant costs £10,000 per converter. However, for our present purpose the estimate is near enough. It appears, then, that we require 60 × 10,000 = £600,000 of capital, to turn out the same quantity of steel that can be turned out in the United States with 20 × 10,000 = £200,000 capital. The interest and depreciation on this sum cannot be reckoned at less than 10 per cent. Each converter, therefore, represents £1,000 a year, but its make in Great Britain being but, in round numbers, 12,000 tons, each ton must be charged with ten-twelfths of a pound sterling, or 16*s.* 8*d.*; while in the United States, as each converter turns out, in round numbers, 36,000 tons per annum, each ton must be charged with 5*s.* 9*d.* The balance in favor of the American on this item alone is, therefore, nearly 11*s.* per ton. When it is borne in mind that 2*s.* 6*d.* per ton in the price of rails may make all the difference between losing and obtaining an order, and that the cost of rolling Bessemer ingots into rails is now actually less than the cost of inspecting the rails, it will be seen that 10*s.* or 11*s.* per ton is an enormous percentage in favor of the American ironmaster. We shall not now stop to explain why the difference exists, nor is it, indeed, certain that the causes are as fully known as is desirable, but the questions involved are so important that they deserve prompt and full discussion.

As to the open hearth process of making steel, we have no means of knowing what the average production per hearth is, but, so far as we can learn, it may be taken at about 150 tons per week on the average. No good statistics exist as to the open hearth work being done abroad, so that we are unable to say with certainty which country obtains the best results; but there are not wanting indications that in this method of making steel America is ahead of us in the quantity turned out. We have said enough, we believe, to show that we cannot remain as a nation content with the progress we have made. Competition with the United States will become keener and keener every day. Protection, combined with other causes, has enormously stimulated the production of iron and steel in the United States; and internal competition prevents the consumer from feeling the evil effects of the tariff. The present demand from the States cannot last. The greatest energy is being displayed at the other side of the Atlantic in putting down plant. In the matter of new Bessemer and open hearth steel works alone, plant is now being constructed capable of turning out 600,000 tons per annum, or, in other words, of doubling the present total make of the country.

The Howgate Arctic Expedition.

Notwithstanding the unfavorable reports of the board of naval officers as to the seaworthiness of the Gulnare, the vessel chosen to convey the Howgate Colony to Greenland, the expedition sailed June 21. The persons composing the expedition are: H. C. Palmer, captain; T. H. Bailey, first mate; A. L. Kenebler, engineer; J. H. Richardson, assistant engineer; Francis Hughes, assistant engineer; E. Smith, carpenter; W. C. Farquhar, steward; Frederick Keyes, cook; William Dowell, fireman; George Jones, fireman; Hugh McKenney, Peter Lawson, Peter Duprince, H. A. Evans, T. H. Dowling, Andrew More, and Arthur Keefe, able seamen; John McFarland, ordinary seaman. Ten of the enlisted men of the army who had been detailed for the service were, at their own request, discharged from the service, so as to go out with the expedition in the employ of Captain Howgate.

The scientific members consist of Dr. O. Pavy, naturalist; Henry Clay, secretary; G. H. Rohe, surgeon; O. T. Sherman, astronomer; W. S. Jewell, meteorologist; George W. Rice, photographer.

The Gulnare will sail direct to Halifax and there take on board Lieutenants G. C. Doane, of the Second United States cavalry, and W. H. Low, of the Twentieth infantry, who have been granted leaves of absence by the Secretary of War, the former for four months and the latter for twelve months. After these officers are shipped the vessel will proceed to St. John's and coal. In consequence of the large quantities of ice floating in the neighborhood of Labrador, the Gulnare will sail to the east and thence to Lady Franklin Bay.

The colony to be established at Lady Franklin Bay will be under the command of Lieutenant Doane. Having landed the permanent party, the Gulnare will return to the United States for a second colony to replace the first, which having become acclimated, will then move further on toward the unknown interior. Though the Gulnare sailed without government aid or indorsement, she was permitted to fly the American flag.

Discoveries at Pompeii.

An almost perfect house has been lately disentombed at Pompeii. It is probably the best preserved of all the Roman dwellings hitherto discovered. There are two atria and a very spacious peristyle, in the middle of which there is an ornamental fountain. There is also a complete bath, which must assist in clearing up some of the doubtful points concerning the arrangement of Roman baths. The paintings in the interior of the house seem to have been executed with considerable taste, and they are in good preservation. Those on the first floor, representing for the most part marine animals, are especially interesting. The frescoes also which are contained in the wings of the building are excellent representations of scenes from animal life. They are so admirably preserved that they cannot fail to shed much light on the condition of painting among the Romans at the time, although they also give evidence of the influence of Greek art.

The Ice Trade in Maine.

Recent reports from the Kennebec Valley state that there is great activity in the ice trade of that region, and prices at Gardner, the headquarters, are fast approaching a fancy basis. The bulk of the sales were made at $2 and $2.50 per ton, but now dealers are refusing $3.75 and holding for $5 later in the season. The supply is fast going into the hands of the large dealers and speculators, and the cities of the Atlantic coast may soon look for another advance in their ice bills. The figures show that there were 800,000 tons secured on the Kennebec last winter, which at $2.50 per ton will produce $2,000,000, a large proportion of which comes into this valley for labor and profit on capital invested. This is more ice by 100,000 tons, than was ever secured on the river before, and the total crop of the State is estimated at 1,500,000 tons.

Another Gorilla in Philadelphia.

Rev. Dr. R. H. Nassau, of Gaboon, West Africa, has laid science under a second obligation by forwarding to Dr. Thomas G. Morton, of Pennsylvania Hospital, Philadelphia, another and larger specimen of the gorilla than the one dissected in that city two years ago. The last specimen is a full grown female and weighs about one hundred and eighty pounds; it is 4 feet 4 inches in height, and measures 41 inches around the chest; the arms are 38½ inches in length and 11 inches in circumference, and the legs are 21 inches long. It is in an excellent state of preservation, save that much of the beast's thick coat of hair has been removed by the action of the rum it was brought in. The animal was shot by an agent of Dr. Nassau, last February.

Fastest Time on Record.

Train No. 4 of the Pennsylvania Railroad recently made the fastest run on record from Philadelphia to Jersey city. The train consisted of locomotive No. 724 and two cars. Edward Osborne was the engineer, and Lewis Lilance conductor. The train left Philadelphia at 12:51, and Jersey City was reached at 2:24 P.M., the trip of ninety miles having been accomplished in precisely ninety-three minutes. Four stops were made, and twice the train was slowed up to cross bridges.—*New York Sun.*

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

CHATTANOOGA, TENN., June 19, 1880.
H. W. Johns M'f'g Co., 87 Maiden Lane, New York:
GENTLEMEN: The (asbestos) paint I got of you last fall is entirely satisfactory. I want nothing better.
Yours respectfully,
(Signed) D. T. CLIPPINGER, Druggist.

We keep a full assortment of Esterbrook's, Gillott's, Spencerian, Perry's, and Lamar's Pens. Send for price list to J. Leach, 86 Nassau St., New York.

Wanted—Situation as Foreman, with a live Brass Finishing Firm, who wish to make a specialty of globe valves and compression work. Address "H," P. O. Box 351, Brookline, Mass.

Carré's French Cylindric Carbons, for Electric Light and Experiments, imported and for sale by C. Raoux, 296 Pearl St., New York. Price list sent to all applicants

State Rights of a Useful Article for sale. Theo. W. Clute, Washington, D. C.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Lubricene, Gear Grease, Cylinder and Machinery Oils. R. J. Chard, 6 Burling Slip, New York.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Our new Stylographic Pen (just patented), having the duplex interchangeable point section, is the very latest improvement. The Stylographic Pen Co., Room 13, 169 Broadway, N. Y.

Shaw's U. S. Standard of Pressure. Mercury Gauges, all pressures, Steam, Hydraulic, and Vacuum. Best for pumping stations and pipe lines. 915 Ridge Ave., Philadelphia, Pa.

Advertising of all kinds in all American Newspapers. Special lists free. Address E. N. Freshman & Bros., Cincinnati, O.

For Sale.—A Baltimore City Fire Department Steam Fire Engine, in complete working order. Address P.O. Box 676, Baltimore, Md.

Metallic Piston Rod Packing Company, 773 Broad St., Newark, N. J. Agents wanted; terms liberal.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Asbestos Board on Chimneys prevents their heat from affecting the temperature of rooms through which they pass. Asbestos Pat. Fiber Co., lim., 194 Broadway, N. Y.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N.Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Sou & Co., Pittsburg, Pa.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros. 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Forsaith & Co., Manchester, N. H., & 207 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Air Compressors, Blowing Engines, Steam Pumping Machinery, Hydraulic Presses. Philadelphia Hydraulic Works, Philadelphia, Pa.

For Alcott's Improved Turbine, see adv. p. 297.

Burgess' Non-conductor for Heated Surfaces; easily applied, efficient, and inexpensive. Applicable to plain or curved surfaces, pipes, elbows, and valves. See p. 284.

Eclipse Portable Engine. See illustrated adv., p. 413.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 13. Totten & Co., Pittsburg.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Blake "Lion and Eagle" Imp'd Crusher. See p. 13.

Steam Engines, Boilers, Portable Railroads, Sugar Mills. Atlantic Steam Engine Works, Brooklyn, N. Y.

Peek's Patent Drop Press. See adv., page 14.

Blake's Patent Belt Studs. The best fastening for rubber or leather belts. Greene, Tweed & Co., N. Y.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 13.

Linen Hose for Warehouses and Hotels as protection from fire. Greene, Tweed & Co., 118 Chambers St., N. Y.

Silent Injector, Blower, and Exhauster. See adv. p. 13.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 13.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of last week.

4 to 40 H. P. Steam Engines. See adv. p. 413.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 413.

Air Compressors. Clayton Stm. Pump W'ks, Bk'lyn, N.Y.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

New Economizer Portable Engine. See illus. adv. p. 13.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

Valve Refitting Machine. See adv., page 13.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 13.

Hand Fire Engines, Lift and Force Pumps, for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N.Y., and 93 Liberty St., N. Y. city, U.S.A.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) R. C. writes: In finishing colored gold and gilt work with a scratch brush, electro-platers generally use sour beer, letting it flow freely on to the brush and work. The beer is dirty and bad smelling. Is there any clean fluid which would answer the same purpose? A. Try thin starch water to which has been added a trace of sulphuric acid.

(2) W. H. C. asks: How shall I clean old copper coins without injury to them? A. Dip in strong hot solution of potash or soda, rinse and dip for a moment in nitric acid, after which rinse quickly in running water.

(3) H. P. B. asks how to recover the silver that is contained in a solution of cyanide potassium. A. Place in the open air or under a hood with a good draught; add a small quantity of salt, then dilute sulphuric acid until no further precipitate forms; allow to settle, wash the precipitate with clean hot water; mix it with a small quantity of water acidified with sulphuric acid, and a few fragments of pure zinc; collect and wash the reduced silver, separate the remaining fragments of zinc; dry and melt with a little borax glass.

(4) S. S. writes: 1. A has a mill, the machinery of which is propelled by an overshot wheel with a vent or aperture of 144 inches under a head of water of 2½ feet, or 30 inches; he wishes to remove the overshot wheel and put in a turbine wheel, having 34 inches vent under a head of 20 feet water. Which of the two will discharge the greater amount of water in a given time, and how much, say, in one minute? A. The opening for the overshot wheel with a coefficient of discharge of 0·68, the overshot 318 gallons per minute, and the turbine 234 gallons per minute. 2. I have no work which treats of such questions. Please commend one, if you know of one such. A. D'Aubisson on Hydraulics.

(5) W. & D. ask: What is the best composition to renew the worn surface of gum belts? A. Manufacturers of rubber belts recommend "a composition of equal parts of black lead and litharge mixed with boiled linseed oil, and japan enough to make it dry quick." It is to be put on with a painter's brush.

(6) W. B. asks: Does it make any difference where the exhaust pipe enters the cylinder of an engine? If so, where is the right place? A. If a horizontal engine, it is generally preferred to have it enter as near the lower side as possible, as it will then drain the cylinder of any water of condensation.

(7) W. P. L. writes: I have a stream of water which will supply 20 cubic feet a minute, with a fall of six feet. Could I obtain sufficient power from it with any kind of wheel, to run a wood-turning lathe for turning small stuff without damming the water? What power would it supply? A. Your fall of water, if properly applied to a good water wheel, would give you about one-fifth of one horse power, which would do your work, but not without some kind of a dam, or its equivalent, to control the water.

(8) S. L. Z. asks: 1. What starch is used in laundrying new-made shirts, how applied, and how ironed? A. Use corn starch, boil to smooth paste, cool, and starch the goods; dry quickly. Before ironing, dampen down in thin, raw (unboiled) starch water. A little gum arabic or pure white wax is often added to the boiled starch to afford fine gloss. Iron in the usual way, with a common sad iron; then dampen slightly with a clean cloth and the starch (raw) water, and polish briskly with a polishing iron. 2. Where can I apply for information in regard to unclaimed estates in Germany? A. Probably German Consul General U. S. could assist you.

(9) "Fax" asks: What will effectually keep off mosquitoes? A. Try an infusion of pennyroyal in water, or an infusion of quassia chips.

(10) O. L. W. asks: 1. How is a vacuum in steam engine produced? A. By condensing the steam in the containing vessel. 2. How to line up a cross head and shaft of an engine? A. To explain this would require too much of our space. Consult "Roper's Hand Book of Land and Marine Engines," page 127. 3. The rule for figuring the horse power of an engine? A. Square the diameter (in inches) of the cylinder, multiply the result by 0·7854, then multiply this product by the average pressure of steam per square inch on the piston, and this product by the number of feet the piston travels per minute, and divide by 33,000. The quotient is the nominal horse power, from which deduct 20 per cent for friction. 4. How can we tell when the center of the piston is in the center of the cylinder? A. By measuring with proper gauges.

(11) O. N. B. writes: 1. A while ago, having found several scratches on my window, I wished to get them out; so taking some flour of emery and rubbing it down, I succeeded in getting out the scratches, but did not succeed in leaving the window as I wished. Now, the thing I wish to know is, what will restore the glass to its former polish? Have tried rotten stone and oil, but no effect was produced. A. Use finest rouge or putty powder, moistened with water. 2. Wishing to make some mucilage, and make it as cheaply as possible, I write to you to find out how to do it. A. Dissolve a sufficient quantity of gum dextrine or gum arabic in hot water, and add a few drops of clove oil to prevent mouldiness.

(12) J. V. R. asks: Would an electro-magnet wound with two smaller wires be as efficient as one wound with one wire just equal in weight of metal to the two smaller—in each case the magnets to be of the same size and contain the same relative weight of metal? A. No, as it would be impossible to wind the two wires as compactly as the one larger one; however, there would not be a great deal of difference.

(13) J. S. P. asks for a composition for rendering light canvas waterproof, which will not crack the canvas. A. Saturate the fibers with soap by boiling in strong soapsuds (castile or curd soap); press out the excess of liquid, and steep for twenty-four hours in a strong aqueous solution of alum; rinse in water, and repeat if necessary.

(14) J. B. M. writes: 1. Suppose in a cylinder, with two pistons at liberty freely to move, we interpose a block between the two pistons and exhaust the atmosphere between the pistons, what is the pressure on the block as compared with what it would be if the block be placed between a stationary cylinder head and one movable piston and the air exhausted? A. There is no difference. 2. And in each case how is the amount of pressure to be estimated, taking no account of friction, weight, or inertia of the piston? A. In either case multiply the area of one piston in square inches by 14·75, the result is total pressure in pounds.

(15) B. W. M. writes: I wish to do my own insurance, and want to know what machinery I would need to throw an eighty foot stream of water, what size hose and nozzle, how much horse power, etc.? I have a twenty-five foot deep well, and my buildings will be seventy-five feet deep, fifty feet front, and about twenty-five feet high. A. Use one nozzle, 1⅛ inches diameter, or two of ⅞ inch diameter; hose 2½ inches diameter. A steam pump, with 10 inches diameter steam cylinder, and 6 inches water cylinder, by 12 inches stroke, would suit; or if you use a "hand" fire engine, get one of the largest class, with 8 inches diameter pumps. When in full work they require about forty men on the brakes.

(16) R. E. M. asks: 1. Does a cylinder become smaller in the bore by the expansion upon becoming hot? The cylinder is 10 inches bore, about 1¼ inches in thickness. A. No. 2. Can you inform me where I can get a good reliable book, at a moderate cost, giving directions for hammering saws? A. You will find a good article on the subject on p. 259, Vol. 36, SCIENTIFIC AMERICAN.

(17) W. L. I. writes: I have an engine cylinder, 9½x18 inches, and 7 foot drive wheel. Is a 1½ inch steam pipe large enough to give full power to engine? A. No, it should be at least 2¼ inches diameter.

(18) E. J. O. writes: Having read your article on elevators in the SCIENTIFIC AMERICAN of June 5, it occurs to me that the differential block and chain might be applied to hoisting and descending; it would doubtless be safer than anything now used, and would require but a small engine to work at. I presume if some one or more of our elevator makers had the matter brought before them through proper channels they might be induced to try the experiment. A. We have no doubt such an application of the differential block might be made successfully.

(19) E. S. M. asks: How much pressure can one man give with a jack screw, lever four feet long, and screw four threads to the inch? A. 192 times the amount of pull on the end of the lever, less about thirty per cent for friction.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

C.—The samples probably contain no gold; a fire assay is the only way of settling this point beyond doubt.—A. A. R.—It is a ferruginous (iron impregnated), silicious clay, containing a small quantity of carbonaceous matters. Of little value.—A. M. C.—They consist chiefly of iron sulphuret (pyrites). Of little value.—H. F. C., Jr.—quartz and mica.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

June 8, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Adjustable bracket, C. E. Kells, Jr. 228,645
Air cylinders, relief valve for, J. Hoyt 228,532
Air engine, J. A. Woodbury *et al.* ..... 228,712 to 228,716
Air engine heater, J. A. Woodbury *et al.* 228,717
Album, J. W. H. Doubler 228,451
Alloy, metallic, C. J. A. & G. A. Dick 228,615
Animal trap, J. L. Symonds 228,693
Annunciator drop, J. M. Wheeler 228,578
Ax, A. K. Roberson 228,681
Axle box, car, T. L. Luders 228,657
Bale tie, D. A. Kilmer 228,648, 228,649
Baling press, J. Cook 228,515
Barbing machine, T. J. & P. F. Howe 228,635
Bed lounge, G. Snyder 228,690
Beehive, S. Moore 228,666
Beveled gears, machine for trimming, Smith & Course 228,687
Binder for books, metallic self, C. M. Jelliff 228,642
Binder, temporary, S. R. Hopkins 228,637
Binder, temporary, G. F. Willis 228,591
Bird cage, H. Bishop 228,488
Blast furnace, J. M. Hartman 228,528
Bol or strap fastener, N. Thompson 228,697
Boot and shoe heel linings, device for repairing, C. E. Whittlesey 228,709
Boot and shoe soles, machine for shaping, J. B. Johnson (r) 9,245
Boot, India-rubber, G. Watkinson 228,498
Bottle stopper, A. Albertson 228,433, 228,434
Bottle stopper, J. J. Allison 228,582
Bottle stopper, J. G. Krieger 228,650
Bottling machine, Gillman & Spencer 228,625
Bracket hook, J. S. Lash 228,652
Bridge gate, safety, A. Hunt 228,640
Bridle binder, G. D. Smith 228,564
Brush holding cap for mucilage bottles, etc., M. W. Carr 228,603
Buckle, W. T. Reaser 228,678
Burglar alarm, K. E. Timmermann 228,490
Burial case, Reese & Zell 228,679
Button, separable, E. Shrier 228,563
Calculator, B. L. Davis 228,448
Caloric engine, J. Jenkins 228,643
Can opener, W. E. Brock 228,595
Car basket rack, railway, W. G. Creamer (r) 9,238
Car brake, C. Ammarell 228,584
Car coupling, J. H. Bull 228,599
Car coupling, E. H. Moorman 228,469
Car coupling, G. W. Putman 228,675
Car, stock, C. H. & W. G. Webster 228,499
Carpet stretcher, J. M. Miller 228,663
Carpet stretcher, Smith & Winters 228,689
Carriage clips, die for swaging, S. M. Hoye 228,636
Carriage curtain fastener, H. P. Hunt 228,536
Carriage dash frame, G. M. Peters 228,474
Carriage dashes, fastening attachment for, B. J. Warden 228,575
Carriage seat iron for shifting rails, G. E Spare 228,483
Carriage top, O. C. Coggins 228,444
Cartridge, B. E. Valentine 228,494
Cartridge crimping machines, feed attachment to metallic, Day & Lewis 228,447
Casks and bottles under pressure, apparatus for filling, J. C. G. Hupfel 228,639
Chair seat and back, M. Merklen 228,662
Chamber muffler, T. H. Lane 228,539
Chart, dressmaker's, C. H. Griffin 228,527
Cheese safe, W. H. Gordon 228,627
Churn, J. M. Keen 228,646
Clock case, H. J. Davies 228,613
Clock case, Davies & Somers 228,614
Clutch, friction, W. Oesterlein 228,552
Coal washing machine, G. Lauder 228,465
Coffee pot attachment, M. P. Hathaway 228,632
Collar and cuff, G. K. Snow 228,568
Cooking apparatus, D. M. Small 228,482
Cork cutting machine, F. L. Blair 228,489
Cotton chopper, rotary, J. C. Lee 228,653
Cotton condenser, T. Camp (r) 9,234
Crib, child's, F. H. Brown 228,596
Curbing and guttering for sidewalks, etc., F. Timmons 228,700
Dental plugger, G. B. Snow (r) 9,248
Desk, table, D. M. Stevenson 228,570
Diving bells, arm and attachment for, C. F. Pike. 228,556
Door and window fastening, N. Thompson 228,698
Door hanger, J. W. Coburn 228,607
Dust pan, W. H. Stichter 228,692
Easel, A. R. Beal 228,435
Edge trimming tool, Gooding & Taylor 228,456
Electric machine, dynamo, H. S. Maxim 228,543, 228,544
Electric machines, brush for magneto, H. S. Maxim 228,546
Electrical machines, commutator for magneto, H. S. Maxim 228,545
Electro-magnetic motor brake, T. A. Edison 228,617
Elevator, W. I. Page 228,473
Elevator for loading and unloading vessels, S. A. Bates 228,593
Embalming and preserving animal substances process and compound for, P. C. Doremus 228,519
Embroidering machine, E. Cornely 228,445
Envelope letter sheet, A. C. Fletcher 228,521

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Fan, fly, W. O. Lincoln	228,466
Fare box, P. Herdic	228,530
Feed bag for horses, V. H. B. Barrington-Kennett	228,537
Feed water heater, E. Reynolds	228,478
Fertilizers, machine for making, Janssen & Baugh, Jr	228,641
File blanks, grinding machine for, C. Vogel	228,574
Firearm, magazine, A. Schneider	228,560
Fire escape ladder, J. F. H. King	228,647
Fire extinguisher, automatic, L. A. Folsom	228,631
Fishing flies, book for carrying, M. Bray	228,511
Flour mills, disintegrating apparatus for, Nagel & Kaemp	228,669
Folding boat, Murray & Baker	228,470
Foot rest and boot jack, combined, Zimmerman & Clute	228,581
Foot warmer and lantern, comb'd, J. J. Towle	228,701
Fruit drier, W. R. Phillips	228,673
Fruit drier, J. W. Seymour	228,561
Furnace shield, H. McDonald	228,548, 228,549
Garden implement, W. J. Hosack	228,638
Gas apparatus, H. S. Maxim	228,547
Gas meter, A. Carpenter	228,513
Gate, J. M. Bean	228,436
Glass scalloping machine, R. Voit	228,495
Glove fastener, W. H. Storey	228,484
Glue, apparatus for evaporating liquors for the manufacture of, A. & E. Lister	228,542
Glue drying apparatus, A. & E. Lister	228,541
Governor for water wheels, etc., H. D. Snow	228,566
Governor, water elevator, J. C. Fulton	228,524
Grain, middlings, etc., roll for reducing, W. D. Gray	228,525
Harrow, marker, and cultivator, combined, E. Dark *et al.*	228,612
Harrow tooth, G. Nimmo	228,551
Harvester, C. W. Levalley	228,540
Harvester, J. & E. Panton (r)	9,239
Harvester rake and reel, comb'd, W. A. Kirby (r)	9,240
Hat bodies, etc., felting, J. T. Waring	228,704
Hat flanging machine, R. Clark, Jr	228,606
Hay press, W. A. Wright	228,503
Hearse curtain fixture, A. Turnbull	228,702
Horse power, W. A. Wright	228,504
Horse power equalizer, J. T. Warren	228,576
Horseshoe, W. H. Hulings	228,533
Horseshoe, A. M. Truax	228,492
Ice, production of cold for manufacturing, C. M. T. Du Motay	228,488
Ironing machines, clothes supporting apron for, H. E. Smith	228,565
Knitting machine, circular, B. F. Shaw	228,480
Lacing hook, M. Bray	228,509
Lacing hook, boot and shoe, M. Bray	228,510
Lamp, mill, P. Wall	228,497
Lard cooler, G. A. Stanley	228,691
Last, W. R. Miller	228,664
Latch, W. E. Sparks	228,569
Leaf turner, W. & J. M. Burkart	228,600
Leather pulp, production of articles by solidifying, Hyatt & Stevens	228,463
Leather splitting and beveling machinery, Dancel & Smith (r)	9,235
Life preserving mattress, B. Palmer	228,671
Loom, circular, A. Ball	228,589
Loom doup heddle, G. Ziegler	228,580
Mail lock label holder, J. E. Thomson	228,573
Manure rake, E. M. Hand	228,631
Match box, C. Buckley	228,598
Match safe, H. H. Elwell	228,452
Meat chopper, A. T. Huff	228,535
Metal working press, Perkins & McNaught	228,554
Metallic can and box, M. Bray	228,512
Milk cooler, F. G. Butler	228,602
Milk receptacle, M. P. Allen	228,583
Millstone dressing machine, P. M. Haas	228,630
Mining drills, steel bar for, W. A. Sweet	228,485
Mirror, reflecting, C. Weidt	228,706
Monkey wrench, S. H. Bellows	228,437
Mop wringer, A. L. Burtis	228,601
Motion. apparatus for transmitting chronometric, H. J. Wenzel	228,577
Nuts, cleaning and separating, B. F. Walters	228,703
Oatmeal machine, W. Eberhard	228,520
Oatmeal machine, W. Heston	228,531
Ore separating apparatus, W. L. Imlay	228,719
Oven and oven door, W. C. Davis (r)	9,243
Ovens, pan rest for, Filley & Boileau	228,620
Packing, steam piston, W. W. St. John	228,571
Padlock, J. Loch	228,656
Padlock, permutation, Estes & Buckley	228,619
Paper cutting machine, G. W. Smith	228,686
Piano string bridge, W. C. Ellis (r)	9,237
Pile, iron, I. W. Maclay	228,467
Pipe wrench, W. C. Westerfield	228,707
Pitcher, double-walled, A. G. Golding	228,626
Planter, corn, F. S. Wing	229,710
Plastering, forming hard finish on, Arrouquier & Barrett	228,587
Plow point, reversible, M. M. Bowers (r)	9,236
Plow, sulky, G. M. Marks	228,659
Plow, sulky, W. B. Quick	228,676
Pole and harness, combined, J. Emmel	228,453
Pole, carriage, H. Tine	228,699
Portable, elevator, H. H. Barnes	228,591
Portable engine furnaces, attachment for, G. W. Thayer	228,489
Potato slicer, J. Whitehead	228,708
Presses, circular feed apparatus for, G. H. Perkins	228,553
Pressure gauge, recording, A. M. Sherman	228,479
Printing machine feeding mechanism, J. T. Hawkins	228,529
Printing pad, elastic transfer, G. K. Snow	228,567
Printing, photo-mechanical, J. H. Whitley	228,579
Printing press, multiple color, S. Crump	228,517
Privy wells, strainer for, B. Mensch	228,661
Pulp mills, feed mechanism for wood, A. W. Priest	228,477
Pump and feed water heater, G. Kratz	228,538
Pump valve, lift, H. V. Myer	228,668
Radiator, J. Du Bois	228,616
Railway cattle gate, D. Hamman	228,459
Railway signal, A. J. Rose	228,683
Railway signal, electric, O. Gassett	228,455
Railway signal, pneumatic, D. & T. Morris	228,550
Railway switch, J. M. Moore	228,665
Railway tracks, apparatus for laying, T. Adams	228,505
Refrigerating process and apparatus, C. T. Du Motay	228,487
Rein holder, A. Warth	228,705
Rivers navigable, device for rendering, H. Haupt	228,633
Road engine, T. Aveling	228,588
Rolling steel bars for mining drills, roll for, W. A. Sweet	228,486
Sash fastener, A. E. French	228,523
Sash lock, Nickerson & Tansey	228,471, 228,472
Saw filing machine, gin, W. B. Johnson	228,644
Scarf, neck, C. C. Hancock	228,460
Sealing press, punch, etc., J. E. Thomson	228,572
Sewer gas trap, A. F. Pflughaupt, Jr.	228,674
Sewing machine, J. Connelly	228,611
Sewing machine needle, W. C. Cross	228,446
Sewing machine folding attachment, Foley & Comee	228,622
Sewing machine ruffling or gathering attachment, J. M. Griest	228,457
Sewing machine, straw braid, E. Wiseman	228,711
Shade holder, N. L. Bradley	228,594
Shingle drying apparatus, W. A. Kitts	228,464
Shirt bosom attachment, L. Churchill	228,514
Shoe nail wire, O. R. Chaplin	228,605
Shoe tip, H. White	229,500
Shot machine, E. Shiver	228,481
Skylight, Campbell & Dunlevy	228,443
Slate, reversible, S. Reed	228,559
Sleigh bell strap, C. G. Bevin	228,508
Snap hook, W. Grassick	228,628
Spark arrester, H. R. Campbell	228,442
Spectacles, Wilson & Meigs (r)	9,241
Spindles, machine for grinding, A. Ball	228,590
Spur, A. Buermann	228,441
Staging, portable and adjustable, A. Dawes	228,518
Stamp feeder, ore, E. Coleman	228,609
Steam boiler, W. M. Fisher	228,521
Steam engine, hydro, C. F. Pike	228,555
Steam heater, J. B. Pierce	228,475
Still, alcohol, A. Dieryckx	228,449
Stirrup, O. V. Flora (r)	9,244
Stool and cane, combined, Nelson & Young	228,670
Stove cover lifter, L. P. Harder	228,461
Stove, heating, G. R. Moore (r)	9,247
Stove, reservoir cook, R. Galbraith	228,454
Submarine grappling tools, operating, C. F. Pike	228,557
Tablet holder and hand stamp, combined, J. F. Barrows	222,592
Telegraph, duplex, W. Hadden	228,458
Telegraphs, distributing the wires of underground, W. Mackintosh	228,658
Telegraphic purposes, mechanism for perforating paper for, Anderson & Foote	228,585
Telegraphic purposes, mechanism for perforating paper for, Foote & Anderson	228,623
Telegraphic sounder, T. Cochran	228,608
Telephone systems, switch and signaling apparatus for, G. L. Anders	228,586
Telephone transmitter, electrie, A. G. Bell	228,507
Theater stage, M. H. Mallory	228,468
Thill coupling, E. Beebe *et al.*	228,506
Thill coupling, J. Rupert	228,684
Tie strap attachment, Hudson & Alderman	228,534
Time lock, F. McDuffee (r)	9,246
Toilet implement, duplex, A. McDonald	228,660
Torch, H. Profontaine	228,476
Torpedo, grave, R. B. Lanum	228,651
Toy locomotive, J. B. Secor	228,562
Toy pistol, J. H. Rose	228,682
Truck, car, I. C. Terry	228,694
Twine cutter, J. A. Crocker	228,516
Type bed, revolving, J. W. Richards	227,680
Valve, automatic relief, B. O. Tyler	228,493
Valve, safety, J. Absterdam (r)	9,242
Valves, electrical apparatus for operating, C. F. Pike	228,558
Vehicle, spring, W. M. Harris	228,462
Velocipede, A. Vick	228,496
Vent, barrel, A. Bottger	228,440
Vessel, covered, G. B. Thompson	228,696
Vessels, folding keel for, E. R. Dodge	229,450
Votes, register for counting, R. S. Conover	228,610
Wagon, dumping, J. S. Linthicum	228,655
Wagon seat, M. Tompkins	238,491
Washing machine, G. E. Moncrief	228,667
Washing machine, J. Sandles	228,635
Water cooler and purifier, subterranean, G. Emerson	228,618
Water elevator, W. F. Smith	228,688
Water wheel, turbine, W. Hacheney	228,629
Weather strip, J. M. Cels	228,604
Weather strip, D. L. Grant	228,526
Wind engine, A. Thomson	228,695
Windmill, Payne & Danforth	228,672
Windmill, J. J. Reed	228,677
Wire springs, machine for forming conical, D. H. Gail	228,624
Wood, flexible band for bending, E. L. Buckingham	228,597
Wrench, A. J. Hig ins	228,634
Yoke, neck. W. W, Winter	228,502

DESIGNS.

Chandelier hook, R. Christesen	11,808, 11,809
Cigar box, F. W. Sigourney	11,819
Clock and inkstand, C. Kitschelt	11,813
Clock stand, C. Kitschelt	11,811
Coffin handle, J. W. Rogers	11,818
Coffin handle sockets, F. W. Brocksieper	11,807
Coffin handle socket, E. A. Cuppers	11,810
Door pull, H. Jaworski	11,816
Drinking fountain, H. F. Jenks	11,817
Pencil case barrel, J. C. Aiken	11,806
Range, I. A. Sheppard	11,815
Spoon and fork, G. Wilkinson	11,814
Toilet stand, C. Kitscheit	11,812

TRADE MARKS.

Bitters, tonic, H. E. Bucklen	7,938
Cigars, cigarettes, and smoking and chewing tobacco, Haworth & Williams	7,935
Cigars, cigarettes, and smoking tobacco, Straiton & Storm	7,937
Stove and range, cooking, Evers & Temme	7,934
Thread, cotton, J. E. Peck	7,936
Tubing, metal, National Tube Works Company	7,939

English Patents Issued to Americans.

From May 25 to June 1, 1880, inclusive.

Firearms, A. Schneider *et al.*, San Francisco, Cal.
Flour mills, L. Bean, Washington, D. C.
Grain weighing machine, J. W. Hull, Cincinnati, O.
Grain weighing machine, J. B. Stoner, Toledo, O.
Gun support, E. G. Parkhurst, Hartford, Conn.
Heel stiffener, H. G. Farr *et al.*, Brandon, Vt.
Indicator, steam engine, G. H. Crosby, Mass.
Life raft, L. H. Raymond *et al.*, New York city.
Loom, G. Compton, Worcester, Mass.
Motive ower apparatus, E. Abbiatti *et al.*, N. Y. city.
Organs, reed, G. W. Sumner *et al.*, Boston, Mass.
Paper, perforated, T. M. Foote *et al.*, Brooklyn, N. Y.
Printing machine, chromatic, E. E. Caduc, Boston, Mass.
Preserving meat, W. C. Marshall, New York city.
Rolls and roll pinions, R. C. Tatten, Allegheny, Pa.
Sewing machine motor, D. S. Van Wyck, Fishkill Landing, N. Y.
Steam engine, P. Murray, Newark, N. J.
Suppositories (2), E. H. Gibbs, New York city.
Switch, railroad, J. B. Carey, Boston, Mass.
Telephone signal, C. S. Eaton, Lowell, Mass.
Tuning musical instruments, J. Singer, Chicago, Ill.
Water closet, J. L. Roxburgh *et al.*, Charleston, S. C.

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Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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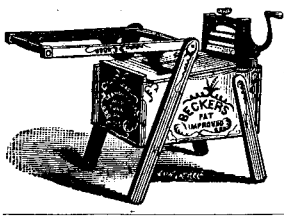

$15,000 worth sold in ten months. $25 will be paid any one who will wash one shirt clean in the same time three are washed with this machine. Machines shipped on trial to any address. Special rates to dealers. Challenge competition.
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TO STOCKING LOOM MAKERS!—REquired, a certain number of looms with the latest improvements, by a manufacturer about to establish a business. Apply to MESSRS. W. KENT & CO., 23 Paternoster Row, London, England.

PROPOSALS FOR MAIL LOCKS AND KEYS.

POST OFFICE DEPARTMENT,
WASHINGTON, D. C., June 22, 1880.

In compliance with a provision in the law entitled "An Act making appropriations for the service of the Post Office Department for the fiscal year ending June 30, 1881, and for other purposes," approved June 11, 1880, requiring a re-advertisement for proposals for Mail Locks and Keys, notice is hereby given that SEPARATE SEALED PROPOSALS will be received at this Department UNTIL 12 O'CLOCK NOON, ON THE SECOND DAY OF AUGUST, 1880, for furnishing five new and different kinds of Locks and Keys for the sole and exclusive use of the United States mails, including, besides those to be used for mail bags, such as are to be used on the street letter-boxes of the United States.

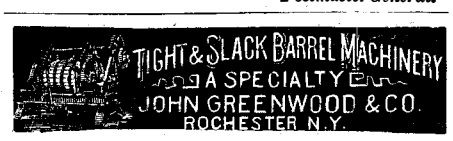
As the public exposure and searching examination necessary to intelligent bidding on any prescribed model of a lock and key would tend to impair, if not entirely destroy, the further utility of all such locks and keys for the purposes of the mails, the Postmaster General prescribes no models or samples for bidders, but relies for a selection on the mechanical skill and ingenuity which a fair competition among inventors, hereby invited, may develop in samples submitted by them.

Proposals, with samples, will also be received at the same time, for Safety Chains for Mail Keys.

Specifications of conditions and requirements as to proposals, samples, kinds and quantities, contracts, etc., as well as forms of proposal, will be furnished on application, by letter, to the Second Assistant Postmaster General. No proposal will be considered, unless it shall have been submitted in accordance with such specifications and forms.

The Contracts which may be made will be in conformity to the specifications and the accepted proposals.

D. M. KEY,
Postmaster General.



TO BUILDERS OF WATER WORKS.

The City of Joplin, Missouri, having determined to provide a system of water supply for the protection of the city against fire, and for domestic and manufacturing use, hereby invites proposals for the furnishing of the same. It is not proposed that the city shall erect and own the works, but shall grant proper franchises, and pay proper charges to a company which shall build, own, and operate the same and furnish the water supply. For the information of such, the following statement is made:

The source of water supply will be Shoal Creek, a never-failing stream of water, in every way satisfactory, distant from the city limits three and five-eighths miles. Distance from Shoal Creek to the summit where the reservoir would be located, two and three-quarters miles. Elevation of summit above main street in the city, about thirty-five feet. Shoal Creek will supply a working head of about eight feet for forcing the water from the creek to the reservoir. Cross section of the stream at common stage about seventy feet.

There will be required about five or six miles of mains, and about fifty fire hydrants in the city limits.

The domestic consumption of water, and its demand for manufacturing purposes in Joplin will be exceptionally large, from the fact that there is now no water supply whatever, except that taken from mining shafts and brought by wagons to the consumer. The quality of this water is unfit for domestic use or for use in steam boilers. Wells cannot be depended upon, owing to the great depth to which the ground is drained by mining shafts. The population of the city is about 10,000.

For further information, apply to the undersigned, to whom all proposals and communications shall be addressed.

J. P. NEWELL, City Clerk,
Joplin, Missouri.

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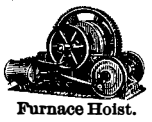

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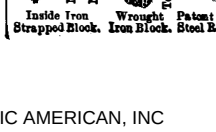
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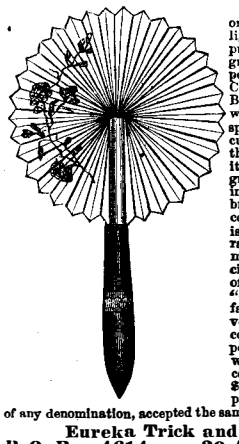

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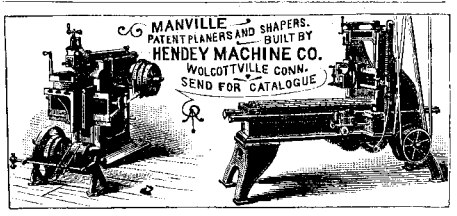

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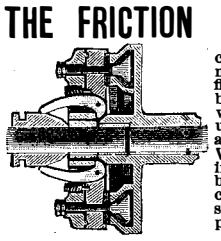

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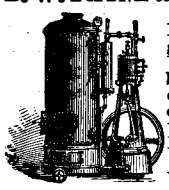

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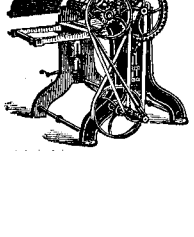

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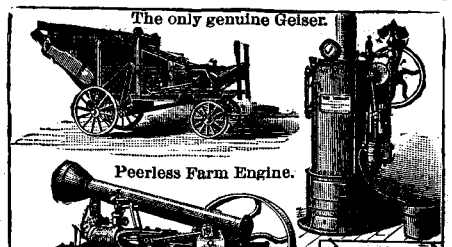

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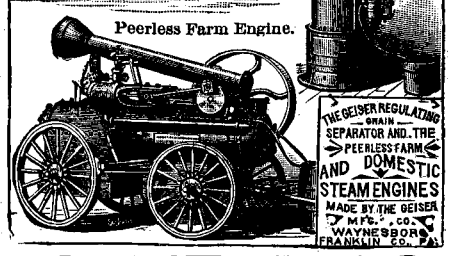
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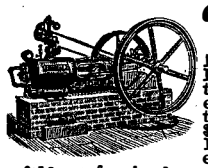

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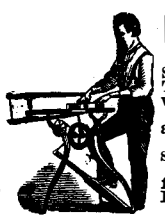

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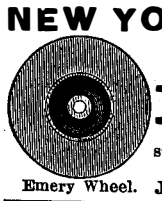

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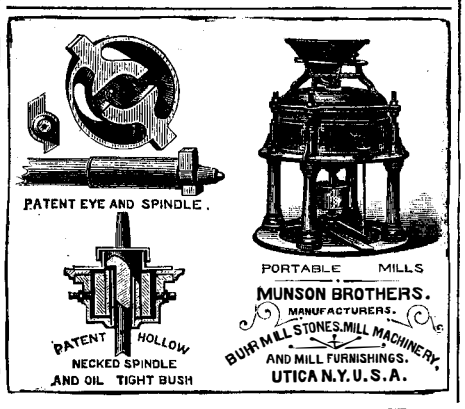
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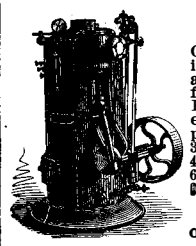

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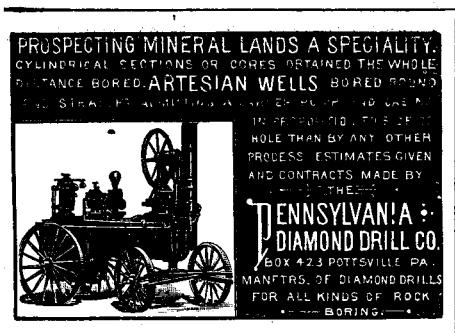
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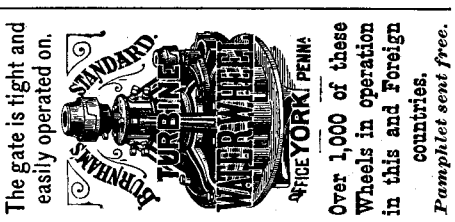

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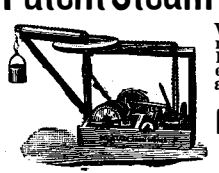

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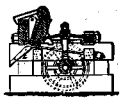

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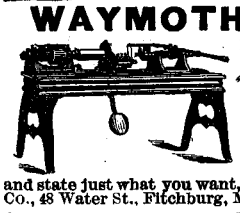

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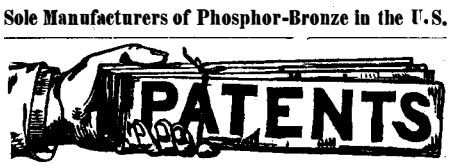

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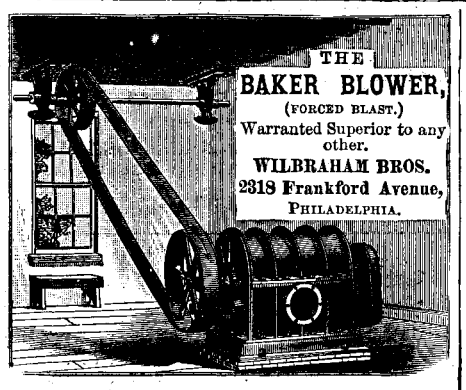

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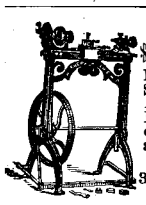

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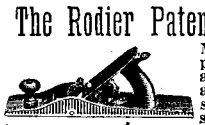

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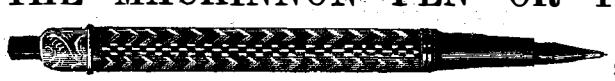

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